



FRIDAY, OCT. 11.

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Contributions.

Locomotive Balancing.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Since the publication of the article on this subject, in which the writer advocated the use of simultaneously moving pistons, and a barring engine for the purpose of pulling an engine off the dead points, should it chance to come to a stop in that position of the crank, two letters, by Mr. W. F. Dixon and "C.," have appeared, finding almost unconditional fault with the proposed arrangement.

These may best be dealt with separately, and first that of Mr. Dixon shall be taken in hand. He finds fault with the proposed "barring engine" as insufficient to do the duty demanded of it except it be of a size equal to the locomotive itself. He supports his opinion by stating that when applied to the engine in a cotton factory the only duty of the little barring engine is to turn the shafting and belting. Though this is not quite the case, it would not, even if it were, be an argument. Those who know anything of cotton-mill work know that as soon as the shafting commences to move many of the machines are set on also. However, this is not the point, which is that the small barring engine, with tight train couplings, must move the whole train, and so be as powerful as the locomotive itself.

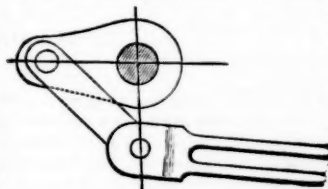
Now, what are the facts. At 60 miles per hour a wheel of 32 ft. circumference revolves 240 times in a mile, i. e. in a minute. The pistons move, say, 4 ft. each per revolution, giving a total piston movement (of both pistons) 1,920 ft. per minute. Taking 18-inch cylinders, and as high as 80 pounds mean pressure, the piston load is 20,350 pounds, and the horse-power developed about 1,160 indicated. This is one way of looking at the matter, and in this light my little barring engine would seem to need to be big enough to drive a 60,000 spindle cotton mill, and it does seem asking too much to burden the foot-plate of a locomotive with three 8-ft. Lancashire boilers and a pair of rope-gear engines grooved for 30 ropes. Is there not another way to look at the question which would show the way to a simpler solution? Experience shows that the capacity of an engine to do work varies with its speed. There is no absolute necessity to start our locomotive off its dead points at 60 miles per hour; we may choose some smaller speed, and reduce the above 1,160 horse-power very considerably. A fresh computation may be made, and we will now assume that the driving wheels shall revolve off the dead points at a speed of one mile per hour. Then we at once reduce the power developed, for the total piston speed, at one mile per hour, is 32 ft. per minute and with mean pressure of, say, 120 lbs. in the cylinder, the horse power is 29½. This is a very sweeping reduction, and it shows us that by reducing the speed from 60 miles to one mile per hour, even with a much later cut off, we do not get more than about one-fortieth of the power, and this miserable fortieth moves off the train from rest, and gets it up to 60 miles an hour in due time. So far, good. The 7 ft. wheel may very well be driven by a 5-in. friction roller on the shaft of our proposed barring engine, roughly about ¼ the drive wheel diameter. To move the locomotive at one mile per hour would then demand that the barring engine should revolve 17 times as fast, or 68 revolutions per minute. An 18-in. cylinder has 254 in. area, ¼ of this is 15 sq. in. Reduce the stroke of the locomotive to 9 in. Then ¾ of 15 sq. in. is 40 in. area. A 7-in. cylinder has an area of 40 sq. in. Here then we find that a pair of barring engine cylinders 7 in. diameter by 9 in. stroke have as much power at 68 revolutions per minute as the locomotive itself at four revolutions per minute. Suppose we decide again to move off the dead points at only half a mile per hour. Then similarly we should find that a pair of 5 in. x 9 in. cylinders would bar her off if geared up to run as fast as before.

Let us now consider if a speed of only two turns of the big wheels is sufficient. With the cranks on the dead points our little barring engine would not require to pull them off more than 3 in. before the united pull of two pistons with full boiler pressure would give all the pull required. Three inches on a circle of 12 in. radius is a twenty-fifth part of a circumference. At two turns per minute, the time occupied in rolling the crank pin to an acting lever arm of 3 in. is thus only the one fiftieth part of a minute or 1½ seconds. Even if the crank pins have to be turned first to the dead point from a point of stoppage later than the point of full gear cut off the time occupied would still fall short of three or four seconds, and so far no credit is taken for the fact that as soon as ever the dead point is passed the pistons will help; they will not wait the 3-in. lever-arm before acting. The little barring engine would start from any position and have a full stroke admission of course, or nearly so; they would commence to revolve a few seconds before starting time, and could be running at a fair speed before being pulled into contact for work, and it seems likely, considering how locomotives do start from rest with one piston just past the latest cut off, and the other (acting) crank at small leverage, that a barring engine with two 4 x 6-in. cylinders would do all the work called for as starters. In the foregoing it has been assumed that the little engines drove the driving wheels by means of a frictional contact.

The calculation has not assumed the possibility of a single thread worm driving a very practicable worm wheel of 18 in. diameter with 56 teeth. Such a gear, which readily occurs to one, would move off the engine at ½ mile per hour and permit 224 turns of the barrer. This is 3.3 times smaller than the 5 x 8 in. size and so our work would be done by a pair of 3½ x 6 in. cylinders running at the very moderate speed of 224 turns per minute, and it would hardly be looked on as practical to use cylinders less than this. Such an engine would take very little space and would be entirely practicable, as stated before. Indeed it is only prejudice and conservatism which cause so rigid an adherence to the old unmechanical idea of a high-speed machine so crudely designed for steady work as is a locomotive of the present type. Single-cylinder engines, which the projected locomotives would be, are common enough elsewhere. They run screw steamers from Liverpool to China, drive spinning mills requiring the most steady turning, and may be seen even on Sound boats, and could be used even on a stopping train without a hitch.

As regards "C's" objections on the score of the coupling rods. In the first place, high-speed locomotives do not require coupling rods; they have all the adhesion they want or can utilize when running at speed, but it may be pointed out here that a coupling rod is a revolving weight, and as such may be perfectly balanced without introducing any bad effects by a weight in each connected wheel.

In an inside cylinder locomotive, though the two inside cranks would be together, there would be no necessity whatever for the coupling rods to be other than at 90 degrees from each other. This effectually disposes of "C's" arguments and reasons for inside connected engines. For cylinders outside, the placing of wrist pins together and coupling rods at 90 degrees would involve the placing of one coupling rod on an extension from the wrist-pin, thus,



got up on purpose to show this device as a means of carrying working parts, and though awkward in appearance, it does not appear that it introduces more stresses in the wrist-pins than an equally overhung coupling rod of ordinary arrangement. Continental engineers thus overhang eccentrics.

Of course, in a compound locomotive there need be no coupling rods where the high and low pressure cylinders work different wheels.

If there is any reason for the complaints as to the irregularities arising from non-balance of locomotives, they must have as foundation the inequalities of action due to non-simultaneity of piston movement. Any locomotive engineer could test the soundness or otherwise of the views now advanced for the sum of the cost of applying barring engines and moving one wheel 90 degrees on its axle—not a very big order, certainly. Indeed the mere moving of a wheel alone without the barring appliance would show if steady running could or could not be enhanced by the change. The coupling rods also would be taken off for the trial. Surely Mr. Dixon might have this matter tested.

W. H. BOOTH.

The Superintendents' Association.

The eighteenth meeting of the Association of North American Railroad Superintendents was held at the Hotel Brunswick, New York City, on Monday of this week. The meeting was called to order by the President, C. S. Gadsden (Charleston & Savannah). Some thirty members were present, and 14 new members were elected.

The report of the Executive Committee was presented by the Chairman, President Gadsden, presenting the order of business for the meeting, and calling attention to certain financial recommendations. Prof. C. Herschel Koyl, of Easton, Pa., read an interesting paper on signaling, describing his parabolic semaphore, and illustrating by a working

model of the device. The distinctive features of his improvement consist in the original method of illumination, by which the semaphore arm shows red, indicating danger, both by night and by day, when in a horizontal position, and white, indicating safety, both by night and by day, when in an inclined position, the effect produced rendering the signal visible at a much greater distance than an ordinary semaphore. This signal was described in the *Railroad Gazette* of Oct. 19, 1888, and Oct. 4, 1889.

The Committee on Rooms and Headquarters reported that, in their opinion, it was not expedient to procure a permanent headquarters for the Association located at any one city or railroad centre, believing that the best interests of the Association will not be served by having the meetings held permanently in one place, and that the members of the Association should become familiar with the practice of other lines than those on which they are engaged.

The Committee on Roadway, J. B. Morford, chairman, presented a long report, which was accepted, discussing rails, fastenings, spikes, metal ties and safety appliances. The 80-lb. rail of the Michigan Central was recommended for roads of heavy traffic. The Goldie spike, illustrated in the *Railroad Gazette*, Sept. 27, was mentioned as "meritorious" for ordinary work, and the Bush interlocking bolt for track on bridges. J. W. Cloud's new splice bar, illustrated in the *Railroad Gazette*, Oct. 4, was mentioned, and for metal ties that of Mr. Post, engineer of the Belgian state railroads, was regarded as the best. In safety appliances, Piper's semaphore, manufactured at Toronto, Ont.; Koyl's semaphore, and the Jeffrey split switch were recommended. The committee cannot recommend any of the substitutes for frogs. The frogless switch with a rod 75 ft. in length is deemed less safe than the ordinary frog.

On the subject of guard rails on bridges the committee called attention to the pattern adopted on the Michigan Central, and exhibited blue prints of it. That road has taken off its bridge guards of the common form (inside iron rails brought to a point in the centre of the track at either end of the bridge), for the reason, it is stated, that when a truck was derailed it was found to have taken the wrong side of the points in many cases, the cars thus being run into the side of the truss (in a through bridge). The Michigan Central form of guard consists essentially in three ordinary iron or steel rails placed longitudinally between the track rails at equal intervals. These extend straight out several feet beyond the bridge each way, and are beveled at the ends. The cross ties are only 3 in. apart, and the system is expected to guide derailed cars safely over a bridge, whatever position the trucks may be in.

The committee recommended that the prize of \$50, offered at the meeting in St. Louis, in September, 1888, for the best treatise on track work be awarded to the paper bearing the motto "Thistle." There were nine papers presented, all of them long and some very long, going into details with great particularity. The successful one, together with one by "Jon Quill," and one by "Engineer," are to be printed.

The next business was the adoption of the new form of constitution proposed at the last meeting, and printed with the proceedings of that meeting. The principal changes are the following: The name of the association was changed to "The American Society of Railroad Superintendents." The scope of membership was enlarged so as to include, in addition to the active members, honorary members, associate members and delegate members. The principal officers of the Association were made to hold their office two years, and the Executive Committee was enlarged. Some changes were also made in the duties of officers, and annual dues or other assessments are hereafter to be collected by the secretary. The duties of the Executive Committee were defined, and the regular meetings of the Association were made annual instead of semi-annual, to be held in the fall of the year, the present officers holding over until the next regular meeting in the fall of 1890.

A paper was presented by L. W. Palmer, Superintendent of the Providence division of the New York & New England, on the subject of terminal charges. Mr. Palmer pointed out the inequitable features of the system in vogue of dividing revenue on a mileage basis, and called attention to the growing importance of allowing originating and delivering roads a terminal charge on through shipments over three or more roads before pro-rating, because of the increasing cost of terminal grounds and the prospective system of paying for foreign cars by the day. Collecting a sum from consignees for detention of cars does not reimburse terminal roads for track room and switching expenses, for most of the freight is delivered within 48 hours and before the special charge against the consignee begins.

The President, Major Gadsden, called the attention of the meeting to the merits of the weighted switch lever, which has been in use on his and other Southern roads for many years. With this device the ordinary switch is turned by a lever which extends out in a nearly horizontal direction from the track. At its extreme end is a heavy weight, which holds the switch in its normal position (for the main track) by gravity. To run a car to or from the turnout the weighted lever must be held up by the switchman. If he does not disobey orders and prop it up with a stick it must of necessity return to its normal position before he leaves the place. Major Gadsden stated that in a long experience he had known of only two derailments from the misplacement of a switch of this kind, and in both cases the most culpable negligence (or design) was the cause.

There was very little formal discussion at the meeting, except upon the new constitution. The annual assessment and membership fee was increased from \$3 to \$5. A committee was appointed to revise the by-laws and report to the next meeting.

Barr's Wheel Grinder.

The accompanying engravings show a wheel grinder which is so arranged that by it a wheel with a tread out of true will be reduced to a perfectly cylindrical form without either chucking the wheel or using a centering device of any kind. In the cuts *A* represents the wheel to be trued; *B* and *B*¹ rollers which support the wheel; *C* a guide roller which can be rotated on a vertical axis in order to move it in position when it is desired to place a wheel on the machine. *D* represents the abrading wheel, which is carried by a head having a cross, forward and back motion.

In operating the machine the roller *C* is rotated on the vertical supporting axis. A wheel is then rolled into position against the rollers *B* and *B*¹. The guide roller *C* is then thrown against the tread of the wheel as shown, and clamped into position. The roller *B* is set in operation by a belt as shown, and its revolution causes the wheel to be operated upon to be revolved. If the wheel is perfectly cylindrical the points of contact against the rollers *B* and *B*¹ will cause the surface of the tread to move so that the point *E* on a line between the axis of the grinding wheel and the axis of the car wheel will be stationary. If, however, the wheel is not perfectly cylindrical there will be a back and forward motion of the tread of the car wheel at *E* in the direction of the line joining the axes of the car wheel and grinding wheel. If now the grinding wheel *D* is moved forward until it strikes the point of the tread at *E*, it will move furthest in the direction of the car wheel, the tread of the wheel will be gradually ground away at this point, and by continuing this process the car wheel will gradually be brought to such form that there will be no oscillation at the point *E* in the direction of either the axis of the grinding wheel or the axis of the car wheel. When this condition is reached the wheel must be perfectly cylindrical. The action of the wheel depends on the well-known principle that through three points, *E*, and the points of contact with the rollers, one circle can be made to pass, and but one.

This grinder was designed by Mr. J. N. Barr, Superintendent of Motive Power, Chicago, Milwaukee & St. Paul Railway. A number of them are in operation now, and we are assured that the machine will do just what it was designed to do.

The World's Fair.

All the committees appointed by the Mayor of New York to consider the question of an international exhibition in 1892 have held meetings during the past week. The Executive Committee on Legislation met Oct. 4, and made public a document of which the following is a synopsis: As the exhibition is to be international, its primal authority, powers and charter must be derived from Congress. A body chartered by Congress can receive local power from the state to issue stocks and bonds, hold property, etc. The Mayor is invited to appoint a general executive committee, composed of one or more members of each of the special committees, together with members appointed by the governors of the several states; and the Committee on Permanent Organization, Finance and Site and Buildings are requested to present their plans, so far as perfected, in order that the necessary legislative action can be commenced.

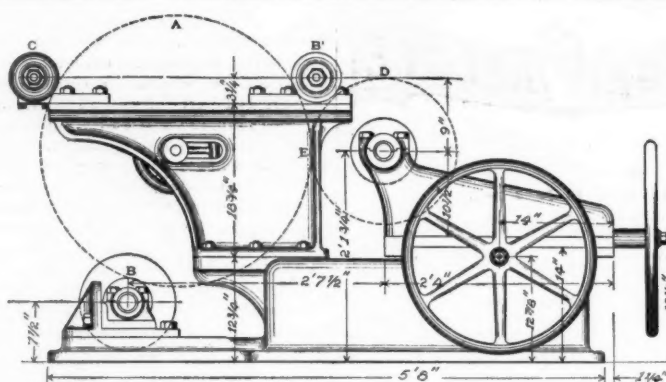
The Executive Committee on Finance presented their long-expected plan at a meeting of the full committee, Oct. 8. They state that money can be raised in three ways: By government and city aid; by the sale of bonds or other evidences of pecuniary interest in the enterprise, and by raising a preliminary guarantee fund by subscriptions to stock. Since the general laws regulating corporations in New York do not permit the formation of a company with a capital stock exceeding \$2,000,000, the committee recommend the third method of raising money for the present, until there has been some legislative action and some assurance of aid from the national and local governments. They propose, therefore, to open books inviting a subscription of \$5,000,000, which shall not be paid until the exhibition is authorized by Congress and the state.

The Committee on Permanent Organization held its first meeting Oct. 8, and organized by electing Mr. Henry G. Marquand as President, Mr. George C. Haven as Vice-President and Mr. E. C. Stanton as Secretary. The president was authorized to appoint an executive committee.

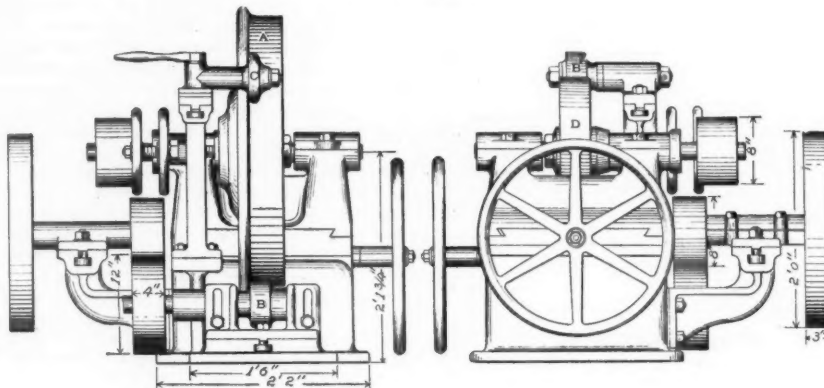
The Committee on Site and Buildings also met, Oct. 8, and the sub-committee made a report which will probably be presented to the General Committee at an early meeting. This report fixes the site, as previously stated, (see *Railroad Gazette*, Oct. 4, 1889), but contains some other data of interest. The committee estimate that 65 acres will be required for the five principal buildings, and that 250 acres will be the minimum amount of ground which should be provided, although more would be desirable. This will necessitate the use of from 120 to 200 acres of private land, the rental of which would cost from \$1,440,000 to \$2,400,000, and the purchase from \$12,000,000 to \$20,000,000. It is recommended that this land be purchased or rented by the city of New York, and the committee state that this can legally be done, if the necessary legislation is obtained.

During the meeting there was considerable discussion about the use of Central Park, its appropriation being strongly urged by ex-Mayor Grace and Mr. Henry Hilton. The following resolutions were adopted:

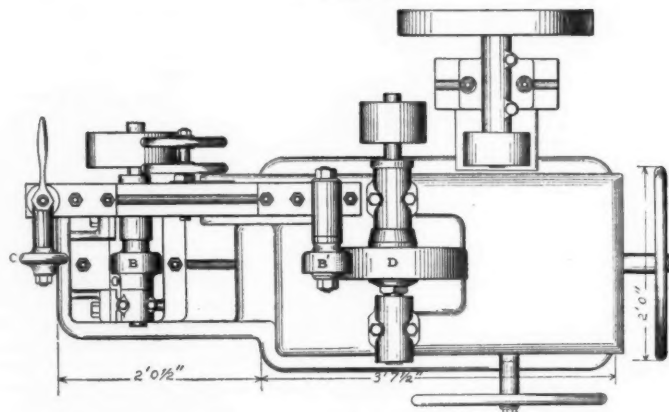
"Resolved, That the proposed site * * * shall be held to comprise such portions of Central Park north of Ninety-seventh street as are physically available and may be found absolutely necessary for the purpose of the Exposition, * * * lands fronting on the north and east of Central Park, and that all efforts should be concentrated upon the acquisition of the needed area in this locality.



Side Elevation.



End Elevations.



Plan.

BARR'S WHEEL GRINDER.

"In view of the impossibility of securing property for the site of the World's Fair by other means, we recommend that immediate action be taken to prepare such legislation as is necessary to enable the city to condemn and take such property for temporary or permanent use. * * *

During the discussion ex-Mayor Cooper stated that "as to the method of obtaining the ground, he had consulted lawyers, and he believed that it would be necessary for the legislature first to pass a law condemning the necessary land and then to take the matter to the courts and carry it to the Court of Appeals, to determine whether to condemn the land for the Fair was to condemn it for a public use." This is probably the opinion of every one who has tried to obtain land which the owner desired to keep—a notable example being the delay of many months experienced in building the Ninth Avenue Elevated road by the opposition of a single property holder; and it really looks as if there were a determination to fix the site in Central Park as first suggested. This can never be done, in the opinion of many influential citizens; and the Committee on Site and Buildings will probably succeed in killing the enterprise, both by reason of fighting a sentiment which is not to be despised, and because, even if the necessary legislation is secured, it will probably be too late. As remarked by a critic, who does not admire the manner in which affairs have been conducted: "If Morningside and Riverside parks were anything but long strips of land unsuitable for buildings larger than a refreshment saloon; and if the five hundred owners of the sunken and unfilled lots east of Morningside Park would agree to give up (without law proceedings, and with little compensation) the use of their lots for four years to our Committee on Sites, and if the Bloomingdale lunatics and the orphans could be turned out and their grounds be secured now; and if the 200 acres of the handsomest and roughest part of the Central Park could be secured now, and the law of 1881, preventing it, could be repealed now—why, then, how easily the Finance Committee could perfect their plans and arrange to have the World's Fair of 1892 in New York City * * * Congress meets in December, and if New York cannot go before that body with an agreed-upon financial plan and a known obtainable site for the Fair, Chicago (with

both of these imperatively necessary matters settled) will get the great Exposition."

Chicago, in popular language, is bustling. Besides the subscriptions to a guarantee fund of \$5,000,000, the different trades and industries agree to raise certain amounts, and each employer is given a subscription book which he can circulate among his workmen. If genuine enthusiasm and vigorous efforts can be effective, Chicago's hopes and boasts do not seem altogether idle.

The Time Convention.

The fall meeting of the General Time Convention was held at the Hotel Brunswick, New York City, on Wednesday of this week, President H. S. Haines (Savannah, Florida & Western) in the chair. Sixty roads were represented by about 70 delegates.

Nov. 10 was agreed upon as the date for the fall change of time. The Executive Committee reported the membership to be 176 companies, representing 120,891 miles of road.

On committees to be hereafter appointed, a name of a railroad company will be designated for each membership on the committee, the managing officer of the transportation department to be the individual member of the committee unless he shall designate some subordinate official of his company to serve. The Committee on Car Service was made a permanent committee, to consist of nine members, to serve for three years, three members to be elected each year. The present membership of this committee is as follows: New York Central & Hudson River; Lake Shore & Michigan Southern; Pennsylvania; East Tennessee, Virginia & Georgia; New York & New England; Chicago, Burlington & Northern; Chicago, Rock Island & Pacific; Missouri Pacific; Northern Pacific.

The sale of copies of the Proceedings of the Convention to all parties not members thereof at \$1 per copy was authorized.

It was decided to appoint a committee to be known as the "Committee on Safety Appliances," to consider what are the essential requisites in all devices for power brakes,

automatic couplers, interlocking switches, block systems, and for heating and lighting cars, and what action should be taken by the convention with reference thereto. This committee as appointed will consist of representatives of the following-named roads:

Richmond, Fredericksburg & Potomac; Fitchburg; Delaware & Hudson Canal Co.; Philadelphia, Wilmington & Baltimore; Chicago & Northwestern; Baltimore & Ohio Trans Ohio Division; Union Pacific; Southern Pacific Co., (Pacific system); Louisville & Nashville.

The Committee on the Standard Code reported that 15 roads, operating 13,135 miles, have adopted the code in the last six months, and that 79 roads, operating 52,267 miles, are now operating under it.

The plan for the organization of car-service associations and the forms to be used in conducting the work presented by the committee on that subject was with slight amendments approved by the Convention. This plan of organization was given in the *Railroad Gazette* of Sept. 20. The vote of last April, fixing Nov. 1 as the date for these associations to commence work, was rescinded, and each road recommended to put the system in use as soon as possible. The date for the adoption of the mixed plan of settling for interchange car service, which had been fixed for Jan. 1, 1890, was also reconsidered, and the whole subject is to come up for further consideration at the next meeting (April, 1890).

The Standard Axle for 60,000-lb. Cars.

The drawings presented herewith show the dimensions of the standard axle which the Master Car Builders' Association has adopted by its recent letter ballot. The results of the ballot were given in detail in our last week's issue.

The New South Wales Railroads.

A Sidney correspondent of the *Railway Press* (London), gives an interesting account of the condition of the rolling stock of the colonial roads. He says:

"Mr. Eddy and his colleagues in New South Wales were naturally alarmed at the state of the rolling stock, and called in Mr. R. Price-Williams to report on its condition. The report, which was laid before the Legislative Assembly on July 31, reveals a startling and alarming state of things, and shows that political methods have not given way to business management one moment too soon. Mr. Price-Williams opens his report by stating:

"I am so impressed with the exceeding gravity of the present condition of matters that I have decided to lose no time in furnishing you with this report. I find the locomotive carriages and wagon-stock generally in a deplorable condition. Of the 429 engines at present working the traffic, for the most part constructed by leading locomotive builders, five have been on the line for the long period of 33 and 32 years; 29 for periods varying from 22 to 26 years, the mean life of the 34 engines being over 25 years; 34 others have been at work for periods between 15 and 20 years, 19 (or more than half of them) being between 18 and 19 years old. Further, there are 100 engines (or nearly one-quarter of the whole stock) whose ages vary from 10 to 14 years; altogether, as will be seen from the following statements, there are at present 168 engines, or considerably more than one-third of the entire stock, whose mean age is exactly 15½ years, while the age of 56 others verges upon 10 years—the life span, so far as regards the period of renewals of a modern locomotive; the average age of the entire stock being 9¼ years.

"Two engines have run over 600,000 miles. There are at present six locomotives whose mileage varies from 512,000 to 560,000 miles. Twenty-seven engines have run between 400,000 and 500,000 miles, while 135 have run over 250,000 miles.

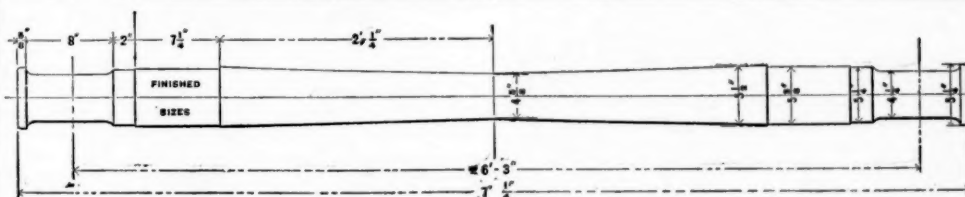
"The significance of this is evident when it is stated that in England 300,000 miles is considered quite far enough for any engine to travel before its principal parts have been entirely renewed, and often, indeed, before the engine is altogether condemned. Only sixteen engines on the New South Wales Railways have been renewed since 1855, the first renewal taking place in 1872. If in this period the stock had been properly maintained, nearly the whole of the 177 engines ought by this time to have been renewed. All, in fact, that has been done in addition to these few renewals has been the replacement of 46 boilers and some crank axles. Most of the engines I had the opportunity of examining have evidently undergone nothing but ordinary repairs, with occasional replacements of minor parts which become worn out in the course of a few years. Deducting the sixteen engines renewed since 1877, and the three others of the standard types furnished with new boilers since 1881, and included among those which have run over 350,000 miles, the number of engines at present requiring renewal would, according to the age test, be 149, and by the mileage test 116. This leaves 234 serviceable engines.

"The carriages and wagons are in equally bad condition. The number of carriages of all descriptions in stock at the beginning of 1889 was 1,084. Of these 170 were of ages varying from 34 to 25 years; the mean age being 28½ years; 25 of ages varying from 20 to 25 years and averaging 17½ years; the age of 127 others varies from 15 to 19 years; while the age of 103 carriages averages nearly 11 years (10.80 years), which is about the mean age of the entire stock, viz., 10.76 years."

"The outlay necessary to restore the present locomotive, carriage and wagon stock to a proper and normal state of efficiency, so as to ensure for the future its being thoroughly maintained and renewed out of the revenue, is put down at £1,357,678. Of this amount £510,645 is recommended to be expended on locomotives, £387,047 on carriages, and £459,986 on wagons.

"The high price of labor in the Colony, and the fact that manufacturers of rolling-stock have only one possible customer, combine to render the locomotive building trade very unprofitable in the colonies. The two last successful bidders for locomotives to be built in New South Wales have both failed, though successful in obtaining orders on very easy terms for 25 locomotives each. One firm failed before the contract was formally signed, and the other before a single locomotive was completed. There is, therefore, some hope that English manufacturers will be able to secure a share of the New South Wales orders."

We may add that there is hope also that American manufacturers can again enter the New South Wales market if the railroads have passed out of political control. In a recent debate in the Legislative Assembly a member of the Government said that the "railway system was in a state of evolution, and it would take fully 12 months before they



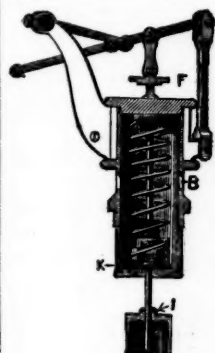
STANDARD AXLE FOR 60,000-LB. CARS.

ADOPTED BY THE MASTER CAR-BUILDERS' ASSOCIATION, SEPTEMBER, 1889.

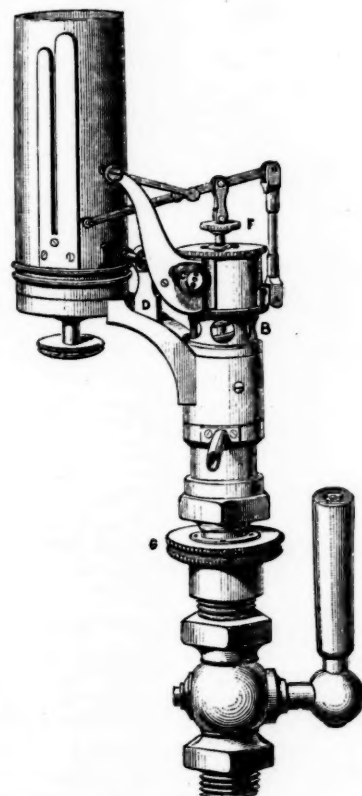
could re-create the department, and 12 months hence they would be able to judge on the net results of the alteration. At the present time he could only say he believed they were on the right way for having their railway business carried on to such an end as would make theirs one of the best railway systems in the world."

Lefebvre's Indicator.

Among the exhibits at the Paris Exposition is a new indicator invented by Mr. Victor Lefebvre, an instrument maker of Paris. Mr. Lefebvre had long observed, so he states, that the ordinary indicators, having the spring within the cylinder, needed frequent repairs to the springs, which rapidly deteriorated. In order to prevent this, he constructed an indicator with the spring in a compartment isolated from the steam cylinder. He also made other modifications in the construction, as shown by the figures. The spring cylinder is placed above the steam cylinder, and between these two cylinders is a chamber having a small tube for the escape of leaking steam and water. The spring cylinder is pierced with five holes B, which permit the free circulation of air around the spring, to prevent heating, oxidation and expansion. Another improvement consists in the manner of guiding the piston. The piston-rod is guided at three points F, K, I, and is thus forced to move in a straight line, even if the steam cylinder is slightly oval, as is occasionally the case. Moreover, the nut F connecting the piston-rod with the parallel motion has three adjusting screws for the purpose of taking up any lost motion due to wear.



parallel motion has three adjusting screws for the purpose of taking up any lost motion due to wear.



Lefebvre's Indicator.

The adjustment of the pencil to the paper barrel is effected by a screw having a non-conducting head and working in a nut, which is fitted into a groove cut in the arm D, uniting the paper barrel to the body of the indicator. This permits delicate contact between the pencil and paper, combined with fixity of position, and prevents the irregularities in the diagram which occur with ordinary indicators at high speed.

Indicators are usually connected to the cocks by differential nuts, which heat rapidly and cannot be manipulated without danger of burning the fingers. In this instrument a single-thread nut, G, is provided, with a head of non-con-

ducting material, large enough to be turned easily and make a tight joint.

It is stated that the diagrams taken with this indicator are free from the wavy lines so often produced by ordinary instruments.

Shop Notes in the Northwest.

MINNEAPOLIS, ST. PAUL & SAULT STE. MARIE.

The "Soo line" shops are located on the main line in the outskirts of Minneapolis, and consist of a general store room and office building, car shop, 90-ft. x 300-ft., machine and erecting shop of the same size and a blacksmith and boiler shop. In addition to the buildings mentioned are an 18-stall roundhouse, small paint shop and oil house. The last is a model in its way and will be described in detail in another issue. Between the car and erecting shops is a large steam transfer-table with the necessary arrangements for quickly running the cars or locomotives on and off by power.

All of the shops are admirably arranged for future enlargement when the demands of the road require. They are heated by steam and leave nothing to be desired in the way of ample light and good ventilation, in which respects they are quite exceptional. The full complement of tools has not yet been received, but the present equipment is from such well-known makers as J. A. Fay & Co., the Niles Tool Works and others of like repute.

The car shops are at present busy on some furniture cars of 40,000 lbs. capacity. The bodies are 40 ft. long, 9 ft. 8 in. from sill to plate and 9 ft. 4 in. wide. They are carried on standard diamond trucks, have Dunham doors and are equipped with Hinson drawbars. Small end doors are also provided. The standard box cars are 34 ft. long, and of 50,000 lbs. capacity. Two standard passenger cars are being converted into sleeping cars for local service, and one officers' car is being made into a dining car, to be held in reserve.

The passenger-car equipment is very fine, consisting of first and second class day cars, sleeping cars, which are owned by the company, and dining cars. The two former classes are all from the works of the Ohio Falls Car Co., and present some novel features in the way of smoking rooms at each end, with, in addition, lavatories and separate toilet rooms for men and women. The two classes only differ in the former having plush, Forney seats, the latter wood slat seats of ash and cherry. The interior finish is in light-colored woods, neatly carved. The exterior is painted Pullman color, with lettering and decoration in gold.

The sleeping and dining cars are from the Barney & Smith Works, and are most luxurious in all their appointments. These are mounted on six-wheel trucks, the day cars having four-wheel trucks. Krupp, steel-tired, 40-in. wheels are used under all the passenger equipment cars, including baggage, express and mail. The cars are heated by the improved Baker heaters, and are all equipped with the Westinghouse train signal, which is in use on the road.

The machine shop is engaged on ordinary locomotive repairs, which are greatly facilitated by having engines of uniform design in all their details in each class. There are three classes, viz.: Light passenger, 16 in. x 24 in., American type, Baldwin; heavy passenger and freight, 17 in. x 24 in., American type, Baldwin; and 18 in. x 24 in. mogul for heavy freight traffic. These last are from the Rhode Island Locomotive Works. The second-class engines weigh 94,000 lbs. in working order; the third, 101,000 lbs. All have straight stacks, extension fronts and present no novelties in their details, but are representative engines from first-class makers. Westinghouse automatic and driver brakes are used, and the train signal is on all the passenger engines. Some ten or twelve of the latter are equipped with a speed recorder which is said to give good results. Solid-end rods are used on the mogul engines.

On the line east from St. Paul to the "Soo," 494.1 miles, the runs are divided up into three of 114 miles each to Gladstone, and one of 151 miles to the "Soo." An exception is, however, made in the case of one passenger run, which is probably the longest in the country. This run is from St. Paul to Pennington, Wis., 227.6 miles, the engine crews going out one day and back the next, with a lay-off of two days.* The freight crews work "first in, first out."

The shops and rolling stock are under the charge of Mr. Thos. A. Frazer, Master Mechanic, assisted by Mr. T. A. Fogue, Chief Draughtsman; and the high standard maintained in everything pertaining to their respective departments reflects great credit upon these gentlemen. A visitor to their headquarters is sure to meet with many courtesies at their hands, and to feel amply repaid for a rather monotonous street-car ride and a tramp across open lots.

CHICAGO, ST. PAUL & KANSAS CITY.

The shops of this line are situated at South Park, one of the suburban stations of the road, about five miles from St.

* A run of 235 miles is made on the Central of Georgia.—EDITOR.

NEW RAILROAD CONSTRUCTION, JANUARY 1 TO OCTOBER 1, 1889.—Continued.

NAME OF ROAD.	Track laid between Jan. 1 and Oct. 1.			Under construction.		
	From.	To.	Miles	From.	To.	Miles.
Interoceanic.	Pueblo, Mex.	Perote.	89	San Martin.	Nanacamilla.	23
				Pantepec	Arnacuas.	29
				Perote.	Vera Cruz.	125
Jacksonv. Tampa & Key West— Jacksonville, St. Aug. & Hal. R.	East Palatka.	Palatka, Fla.	0.5			
Jupiter & Lake Worth.	Jupiter, Fla.	Lake Worth.	7.5			
Johnsonburg.	Johnsonburg, Pa.	Claremont Junc., Pa.	19			
Jones Mountain.	Barry Station, N. Y.	Quarry.	3.3			
Kanawha.				Fairfield, W. Va.	Mines.	10
Kanona & Pleasant.	Kanona, N. Y.	Prattburg, N. Y.	11.44			
Kansas City, Ft. Smith & South.	Neosho, Mo.	Sulphur Sp., Mo.	33.5			
Kansas City, Memphis & Birming.	Main line	Carbon Hill, Ala.	3.60			
Kansas City & Southern	N. Clinton, Mo.	Clinton, Mo.	2			
	Oseola, Mo.	Marshville.	1			
Kansas City & Suburban Belt.				Kansas City, Mo.	Cecil, Mo.	4
Kansas City, Watkins & Gulf.				Lake Charles, La.	North.	50
Kansas City, Wyand. & N. W.						
Kentucky & Nebraska.	Axtell, Kan.	Sumnerfield, Kan.	12.2	Terminus.	Virginia, Neb.	22
Kentucky Midland.	Frankfort, Ky.	Georgetown, Ky.	23	Georgetown, Ky.	Paris, Ky.	17
Kentucky Union.	Winchester, Ky.	Junction, Ky.	6.5	Winchester, Ky.	Lexington, Ky.	15
	Clay City, Ky.	Kentucky River.	30	Kentucky River.	Jackson, Ky.	71
Kinderhook & Hudson.				Hudson, N. Y.	Kinderhook Sta.	17
Knoxville, Cumb. Gap & Louisv.	Knoxville, Tenn.	Cumberland Gap.	68.8			
Lake Erie, Essex & Detroit River.	Ruthven, Ont.	Leamington, Ont.	4			
Lake Temiskamingue.	Knoxville, Tenn.	Kippewa Lake, Ont.	1			
Lehigh Valley.				In Allentown, Pa.		2
Long Island.	Locust Valley	Oyster Bay, L. I.	4.14			
Louisiana, Arkansas & Missouri.				Delhi, La.	Trippie, Ark.	81
Louisville, Evansville & St. Louis.						
Belleville, Centralia & East.				Mt. Vernon, Ill.	Centralia, Ill.	67
Louisville, Hardinsburg & West'n				Irvington, Ky.	Fordsville, Ky.	42
Louisville & Nashville.				Cumberland Gap.	Princess Flats, Va.	47
Birmingham Mineral.	Pineville, Ky.	Cumberland Gap.	15	Gate City, Ala.	Graces, Ala.	3
	Oneonta, Ala.	Ore Mines, Ala.	3.5	Abernaths.	Mines.	3
	Gurley, Ala.	"	1.1			2
	In Indianapolis.	"	.5			
Louisville, New Albany & Chicago	Corydon, Ind.	Kings Cave, Ind.	4			
Louisville, New Albany & Corydon	Slaughter, La.	Bayou Sara, La.	16.5			
Louisville, New Orleans & Texas.	Coahoma, Miss.	Rosedale, Miss.	50			
	Haughton, Miss.	Rolling Fork, Miss.	10.5			
	Lawrenceburg, Ky.	Lexington, Ky.	24			
	Rustburg, Va.	Staunton River.	29	Near Windfall, Va.	Durham, N. C.	95
	Fabyans, N. H.	Scott's Mills, N. H.	17.5			
	Bear Creek, Mich.	East.	9	End of track	Sec. 16 T., 26 N.	20
	Blue Ridge, Ga.	Ducktown, Tenn.	15	Ducktown, Tenn.	Knoxville, Tenn.	85
	Marion, Kan.	Chingawassa, Kan.	8			
				Belair, Md.	Stafford, Md.	16
Deer Creek & Susquehanna	Shelton, W. T.	Southcast	3	Birmingham, Ala.	Lewisburg, Ala.	4
Mason County Central.				Birmingham.	Forest City, "	2
Mary Lee Co. & R. R. Co.				Lewisburg.	Mines.	3
McKeesport & Bellevernon.	End of track.	Bellevernon, Pa.	5			
Meriden, Waterbury & Conn.	End of track.	Waterbury, Conn.	5			
Mexican Central.	Salinas, Mex.	San Luis Potosi.	71	Cardenas	San Luis, Potosi.	162
Mexican Nat. Const. Co.	Armenia, Mex.	Colima, Mex.	30			
	End of track.	Ojo Caliente.	10	Puebla, Mex.	Tehuacan, Mex.	77
Mexican Southern.						
Middleburg, Highland & L. Butler	Middleburg, Fla.	Highland, Fla.	9			
Middleton & Hummelstown.	Middleton, Pa.	Stoverdale, Pa.	5	Sooverdale, Pa.	Hummelstown.	2
Milwaukee, Dexterville & North'n	Newtown, Wis.	Lynn, Wis.	10			
Milwaukee, L. Shore & Western.	Lac du Flambe, Wis.	End of track.	25	End of track	N. Burkuk's Mine	6
Milwaukee & Northern.	Sidnaw, Mich.	Rockland, Mich.	21			
Minnesota & Southeastern.	Main line	Branch No. 5.	3			
Missouri River & Bonne Terre.	Zalle, Mo.	End of track.	10	Terminus.	Crystal City, Mo.	7
Missouri Pacific—						
St. Louis, Iron Mt. & So.	Coffeyville, Kan.	South.	27			
	Wagoner, I. T.	North.	38	Coffeyville	Wagoner.	17
Missouri, Kansas & Texas.	Lancaster, Tex.	Waxahachie, Tex.	13			
Monongahela River.	Fairmont, W. Va.	Kennton, W. Va.	15	Fairmont, W. Va.	Clarksburg, W. Va.	32
Monterey & Mexican Gulf.	Monterey, Mex.	Monte Moreles, Mex.	65	End of track.	Victoria, Mex.	11
Moose River & Jackson Chain.	Moose River, N. Y.	Minnehaha.	4.5			
Mt. Jewett, Kinzua & Riterville.	Mt. Jewett, Pa.	Boyles, Pa.	5			
Napance, Tamworth & Quebec.	Harrowsmith, Ont.	Yarker, Ont.	5			
	Tamworth, Ont.	Tweed, Ont.	20			
Narragansett Pier.				Narragansett Pier.	South Ferry, R. I.	5
Nashville, Chat. & St. Louis.	Dickson, Tenn.	Worley Furnace.	7			
Nashville & Knoxville.				Buffalo Val., Tenn.	Cookeville, Tenn.	22
Nevada—California Oregon.				Lassen Co. 70th mile	123d mile, Colo.	53
N. Orleans, Ft. Jackson & G. Isle.				Algiers, La.	Fort Jackson, La.	40
N. Orleans, Natchez & Ft. Scott.				Vadalia, La.	Rayville, La.	75
New York, Ontario & Western:						
Ont., Carbondale & Scranton.				Hancock, N. Y.	Scranton, Pa.	55
Norfolk & Carolina.	Drivers, Va.	Shingle Creek, Va.	6	Shingle Creek, Va.	Tunis, N. C.	30
	Tarboro, N. C.	Boscobel.	26.5			
Norfolk & Western— Clinch Valley Dis.	End of track.	Swords Ck Sta., Va.	15	End of track	Norton, Va.	70
Northern Pacific.	Laurel Junc., Mont.	Red Lodge, Mont.	43.9			
	Little Falls, Minn.	Staples, Minn.	15	End of track.	Staples, Minn.	15
	Gallatin, Mont.	End of track.	33	Terminus.	Butte, Mont.	37
	Davenport, Wash.	Almira, W. T.	10			
	Morris, Man.	Musselboro, Man.	54			
	Headingley, Man.	Portage la Prairie.	43	Musselboro, Man.	Brandon, Man.	91
	Middleton, N. S.	Lunenburg, N. S.	70			
	Oak Grove, Ala.	Griffin, Ala.	5			
	Henderson, Ky.	Evansville, Ind.	10.5			
			30	No. Attleboro, Mass.	Walpole, Mass.	15
	Hutchinson, Kan.	Kingman, Kan.	30			
	Monroe, Fla.	Sanford, Fla.	4			
	Burnside, N. Y.	South.	1.5	End of track.	Greycourt, N. Y.	8.5
Oregon Improvement Co.— Seattle & Northern.				Anacortes, W. T.	Sterling, W. T.	23
Oregon Railway & Nav. Co.— Oregon Railway Extension.						
Washington & Idaho.						
Oregon & Washington Territory.						
Ottawa & Gatineau Valley.						
Owensboro Falls of R. & G. River.	Owensboro, Ky.	Fordsville, Ky.	28			
Oxford & New Glasgow.	Scotsburn, N. S.	River John	18			
	Oxford, N. S.	East.	8	End of track		32
Pacific Short Line— Nebraska & Western.				South Sioux City.	Plainview, Neb.	82
Pawnee.	Pawnee, Ill.	Pawnee, Junc., Ill.	5			
Pennsylvania— Waverly & New York Bay.				Waverly, N. J.	New York Bay.	6
Pennsylvania, Pough. & Boston.				Walnut Port.	Slatington, Pa.	2
Philadelphia & Reading— Rupert & Bloomsburg.				Kalmig, Pa.	Clark's Valley.	5
Pittsburgh, Ft. Wayne & Chic.— Indianap. & Vincennes.						
Port Arthur, Duluth & Western				Gosport, Ind.	Ellettsville, Ind.	8
Port Clinton Short Line.				Port Arthur, Ont.	Ft. William.	40
Port Townsend Southern.	Short Line Junc.	End of track.	2	Port Clinton, O.	Ottawa Co., O.	12
Puget Sound & Grays Harbor.				Pl. Townsend, W. T.	South.	6
Raritan River.	Kamilche, W. T.	Montesano, W. T.	31			
Ravenswood, Spencer & Glenville	Washington, N. J.	West.	2	Townsend, N. J.	New Brunswick.	6
Redondo Beach.				Ravenswood, W. Va.	Spencer, W. Va.	25
Red River, Sabine & Western.	Los Angeles, Cal.	Redondo Beach.	20			
Richmond & Danville.	Nacogdoches, Tex.	S. Augustine, Tex.	5	S. Augustine, Tex.	Palestine, Tex.	100
High Pt., Randle, Ash. & So.	High Point, N. C.	Ashboro, N. C.	26			
Western N. C.	Winston, N. C.	Yadkin River.	23	Yadkin River.	Wilkesboro, N. C.	50
	Jarrett, N. C.	Valleytown, N. C.	7			
Richmond, Fred. & Pok.	Nicholsville, Ky.	East.	2	Nicholsville, Ky.	At Richmond, Va.	88
Richm., Nichols., Irvine & Beatty.				Richmond, Ky.	Beattyville, Ky.	22
				Walnut Cove, N. C.	Martinsville, Va.	53
Roanoke & Southern.	Winston, N. C.	Walnut Cove, N. C.	18			
Rochester & Glen Haven.	Rochester, N. Y.	Glen Haven, N. Y.	3.72			
Roadway Valley.	New Germantown.	Pottersville, N. Y.	4	Pottersville.	Peapack, N. J.	4
Rogers & Summit.	Durden, Ga.	Stillmore, Ga.	7	Stillmore, Ga.	Feldselle, Ga.	20
St. Augustine & South Beach.				So. Beach Jun., Fla.	So. Beach, Fla.	3
St. Cloud Sugar Belt.	Runnymede, Fla.	Narcosee, Fla.	2.6			
St. Louis & Peoria.	Mount Olive, Ill.	Alhambra, Ill.	14			
San Antonio & Aransas Pass.	End of track.	Houston, Tex.	15	Guadalupe River.	Llano, Tex.	70
	Shiner, Tex.	Luling, Tex.	39.5	Luling, Tex.	Lockhart, Tex.	16
				West Point, Tex.	Waco, Tex.	16

in motion the turning mechanism. The engine room is to be furnished with an indicator showing the position of the bridge, and with signals for necessary communication with the shore.

The bridge is protected by distant and home signals and derailing switches, operated from a tower at the middle of the draw span, and all interlocked. This apparatus has been put in by the Union Switch & Signal Co. The switches and signals are also electrically controlled, so that no movement can be made after a train has entered the protected section. There are nine working levers in the interlocking machine, with spare places. The distant signals are placed 1,740 ft. from the end of the draw on the New London side and 1,870 ft. on the other side. The home signals are 710 and 810 ft. respectively, and the derailing switches 660 and 760 ft. from the ends of the draw span. On the New London side there is a rising grade of 38 ft. to the mile approaching the bridge. On the east side the grade falls 42 ft. to the mile approaching the bridge. It is because of these grades that a difference has been made in the location of the signals. It is probably well known to our readers that this bridge has been built by the Union Bridge Co., and that the Chief Engineer is Mr. A. P. Boller.

New Railroad Construction in 1889.

The accompanying table shows the new track laid in the United States, Canada and Mexico during the nine months from Jan. 1 to Oct. 1, 1889. The table also shows the lines reported as under construction. The new mileage is, by states, as follows :

Alabama.....	65.2	New York.....	111
Arkansas.....	9	Ohio.....	210.5
California.....	97	North Carolina.....	44
Colorado.....	5.5	Oregon.....	7.1
Connecticut.....	0.5	Pennsylvania.....	105.7
Dakota.....	30.8	South Carolina.....	31.7
Florida.....	85.4	Tennessee.....	151.8
Georgia.....	205.7	Texas.....	167.5
Idaho.....	5	Utah.....	124
Illinois.....	78	Vermont.....	16
Indiana.....	102	Washington.....	254.3
Indian Ter.....	107	West Virginia.....	50.8
Kansas.....	56.2	Wisconsin.....	40
Kentucky.....	111.5		
Louisiana.....	75	Total U. S.....	3,111.3
Maine.....	21		
Maryland.....	4.8	Manitoba.....	103
Michigan.....	76.5	New Brunswick.....	45.2
Minnesota.....	60	Nova Scotia.....	90
Mississippi.....	203.5	Ontario.....	127
Missouri.....	86.8	Mexico.....	265
Montana.....	76.9		
Nebraska.....	65	Total foreign.....	639.2
New Jersey.....	32.5		
New Hampshire.....	25.5	Grand total.....	3,750.5

How to Secure Accurate Data.

BY LEWIS F. LYNE.

The late Master Mechanics' Convention, held at Niagara Falls, was, as a whole, probably the most successful one ever convened, and yet it is a source of regret that some of the subjects discussed brought out so little reliable information. In other words, some of the conclusions reached were largely matters of personal opinion. I do not take up this subject with a fault-finding disposition, nor with the least desire to disturb the present good feeling that exists in the organization, but with the hope that the thoughts here advanced may at least have a charitable consideration, so that the work of our society may thereby be productive of the most good. Then each succeeding year will find us engaged in branches of new research and more extended usefulness.

My meaning will be better understood by quoting from one or two of the discussions alluded to. For example, one member asserted that he was using smoke-stacks of unusually small diameter with an increased diameter of exhaust nozzles, while another member claimed that he was using one size of stack for all classes of locomotives. Some claimed that this particular style of stack threw fire, while others were equally sure that it did not. Again, several members stated that they were using engine and truck boxes lined with Babbitt metal, and that it was a grand success, while others claimed that they could not get along with anything but bronze or gun metal, as the Babbitt-lined bearings wore away the axles quite rapidly. Now let me ask why these seeming wide discrepancies.

In the first instance quoted a sufficiently accurate record of each change had not been kept to enable one to determine just where the advantages ceased and the disadvantages began. So to decide this question we must trust to the discretion of the engineer or begin our work all over again. The best way would have been to take a standard locomotive and indicate it carefully, noting all its conditions; then as each succeeding change was made, proceed in the same manner until the end, when, by comparing the data obtained, we should be able to judge of the true merits of each set of experiments. In reference to the use of one size of smoke-stack for all classes of locomotives, it is true so far as the outside dimensions are concerned; but inside there are linings or bushings to suit smaller engines, so that for all practical purposes we have different diameters of stack. It was also true that some of these engines threw fire *mostly at night*, while the others did not!

Some of the members who had used Babbitt metal and had failed to secure good results were in charge of roads where there was a great deal of sharp sand drifting about by the wind. This sand would become imbedded in the soft metal, and thus grind away the axles quite rapidly. On roads where there is little or no sand Babbitt metal is giving excellent results. Such little explanations are too often overlooked, and so the value of the ideas expressed is lost. Almost every master mechanic is convinced that there is a certain practical relation between the diameters of smoke-stacks and exhaust nozzles, but who of us can tell just what that

proportion is? There is also a proper relation between the length of a journal bearing to its diameter to run at the various speeds and carrying different loads, yet who is prepared to give us this very essential information? This is especially essential just now, for the reason that the M. C. B. standard has become too small for the increasing weight which has of necessity been placed upon it. As a natural consequence, in the absence of a standard axle of proper dimensions to carry the required load, each individual is making a combination to suit himself. If this state of things continues it will not be long before we shall find ourselves in the same condition that we were in before the adoption of the M. C. B. standard axle. Before adopting a new standard it is necessary to know something of the laws which govern friction as related to car journal bearings in order that one of the proper dimensions may be selected and adopted. As a rule master mechanics do not have much time for experiment; besides, hardly any reliable investigations of the actual performance of locomotives can be made without the use of proper instruments for that purpose. It is generally unpleasant to secure these instruments by means of a requisition because of the unreasonable objections that are often offered against the purchase of them. It is true a railroad may be run without a pair of indicators, but it is most economical to have them and use them frequently.

When we buy instruments at our own expense, as some of us have done, the company we serve gets the financial benefit, while we pay for and get the knowledge. In the face of all this, I say from experience, it is better to buy a pair of indicators and learn the physiology of the locomotive than to plod along in ignorance of certain well-established laws that govern the distribution of steam in the cylinders of locomotives. The time will come when the knowledge thus gained will be worth more to the individual who has denied himself than the money he invested in the instruments.

In view of the difficulties attending the search for reliable data in the line referred to, what is the best course for us to adopt? Having given this subject considerable thought, I have concluded that the Master Mechanics' Association will very soon find it necessary to establish a small mechanical laboratory for the use of the several committees appointed every year to investigate and report upon different subjects assigned to them. This laboratory should contain, for example, a pair of reliable indicators, or more if found necessary, together with indicator rigs; three-way cocks, counters, barometers, thermometers and a water meter; also a dynamometer to place between the tender and train. The statement that an engine hauled a certain number of cars conveys no accurate idea of the actual work done. The pull should be measured in pounds measured by a scale, and such an instrument is not an expensive one to make either. I have one which will measure a pull of 17,000 lbs., and its cost was very little. In time an oil-testing machine could be added; and a central location should be selected where the necessary experiments could be conducted under the supervision of the various committees. The leading railroads have testing rooms of their own, and the information they gather is private property. They do not wish to make it public, and they have a perfect right to refuse. But there should be, in my opinion, in connection with our committees a means whereby reliable investigations might be prosecuted and the results given to the world at large. If asked, I believe that fully 75 per cent. of the railroads in this country would contribute to an experimental fund to be at the disposal of these committees. It is a true saying that a mechanic cannot work without tools, and the railroad companies ought to appreciate the labors put forth in their interest sufficiently to aid in these investigations. With a fund at their disposal for experimental purposes, the committees would be able if necessary to employ a little assistance so as to make their reports more complete, whereas they now have to depend upon others, and have to pay their own expenses. In committee work it becomes necessary to travel, and I now remember an instance where one member of a certain committee spent \$300 out of his own pocket in the prosecution of his work, which was done gratuitously. Sufficient interest should have been felt in the work of that committee by the railroads of the country to have paid their expenses at least. I believe it would have been done at the time had the matter been presented in an appropriate way to those benefited. Such persons as are unable to express their ideas on paper and yet are known to have good mechanical attainments should be interviewed by a member of the committee, so that their views may be utilized. I hope to hear an expression from others on this subject, and will help all I can in the way of co-operation toward the establishment of the Master Mechanics' Association upon a still more scientific yet practical basis, so that it may rank second to no other similar organization.

The Proposed English Channel Bridge.

The most interesting paper read before the meeting of the British Iron and Steel Institute, lately held at Paris, was presented by Messrs. Schneider & Co., of the Creusot Iron-works and H. Hersent, C. E., proposing a bridge between Cape Grisnez and Folkestone, with maximum spans of 1,640 ft. that shall give a clear waterway at high tide of 177 ft. for the whole distance spanned, and 300 ft. at low tide. The location has been adopted so that advantage can be taken of the reduced depths on two banks in the Channel, Colbart and Varne, about 3½ miles apart, on which there is only 26 ft. of water at low tide, against a maximum depth, on the location chosen, of 180 ft. The total amount of steel required,

NEW RAILROAD CONSTRUCTION, JANUARY 1 TO OCTOBER 1, 1889.—Continued.

NAME OF ROAD.	Track laid between Jan. 1 and Oct. 1.			Under construction.		
	From.	To.	Miles.	From.	To.	Miles.
San Diego, Cuyamaco & Eastern.	San Diego, Cal.	Lakeside, Cal.	22	Santa Rosa, Cal.	Sebastopol.	6
San Francisco & North Pacific.	Hopland, Cal.	Ukiah, Cal.	14	Monrovia, Cal.	Duarte, Cal.	3
San Gabriel Valley Rapid Transit.	W. Alhambra, Cal.	Pasadena, Cal.	3.5	End of track.	Stirling, Ga.	30
Savannah, Americus & Montg'y.	Abbeville, Ga.	McRae, Ga.	30			
Seaboard & Roanoke.						
Geor., Car. & Northern.						
Seattle, Lake Shore & Eastern.	Falls City, W. T.	Snoqualmie Pass.	10	Chester, S. C.	Clinton, S. C.	50
Schuylkill & Lehigh Valley.	Portsmouth, O.	Sciotoville, O.	5.4	Duquesne, J. W. T.	North.	5
Scioto Valley.	Corkscrew, Col.	Albany, Col.	3.75	Bowans, Pa.	Fremont Summit.	40
Silverton.	Embeden, Me.	Carrutunk Falls, Me.	4	Silverton, Col.	Eureka, Col.	8
Sioux City & Northern.	End of track.	Churchport, Va.	21	Sioux City, Ia.	Palisades, Dak.	83
Somers.	Waynesville, Ga.	Terminus.	6	Carrutunk Falls, Me.	Bingham, Me.	8
Sonora, Sinaloa & Chihuahua.				Guaymas, Mex.	Topobolampo.	220
South Atlantic & Ohio.				Clinch River.	Big Stone Gap, Va.	27
South Brunswick Terminal.				End of track.	S. Brunswick, Ga.	9
Southern Pacific.						
Atlantic System.	Victoria, Tex.	Beeville, Tex.	55			
Pacific System.	Paloma, Cal.	Santa Margarita.	3.35			
	Monterey, Cal.	L. Majilla, Cal.	4.43			
	Newman, Cal.	Terminus, Cal.	21.39			
Spokane Falls & Northern.	Spokane Falls, W. T.	Toward Colville.	75			
Staten Island Rapid Transit.						
Suwannee River.	Flagler, Fla.	Bald Hill, Fla.	5.75			
Tabor & Northern.						
Tacoma, Olympia & Chehalis Val.						
Talladega & Coosa Valley.	Barclay's, Ala.	Talladega, Ala.	2.5			
Tennessee Midland.	Lexington, Tenn.	Perryville, Tenn.	24			
Texarkana & Ft. Smith.	End of track.	Red River, Tex.	1			
Tobique Valley.						
Toledo, Ann Arbor & N. M.	Harriette, Mich.	Manistee Junc.	40.5			
Toledo, Columbus & Cincinnati.						
Union Pacific.						
Salt Lake & Western.	Silver City.	Eureka, Utah.	10			
Ultima Thule, Arkadelphia & Miss.	Dulcreek, Ark.	Eldens, Ark.	6			
Utica & Unadilla Valley.						
Vancouver, Klickitat & Yakima.						
Vaudreuil & Prescott.						
Weatherford, Mineral Sp. & N. W.						
Western Counties.						
Western Maryland.						
Balt. & Harrisburg.	Fairfield, Pa.	Highfield, Md.	11			
Weston & Elk River.						
West Virginia Central.	Thomas, W. Va.	Elkins, W. Va.	36			
W. Va., Pineville & Tenn.	Pineville, W. Va.	Coke Ovens.	7.5			
Williamsport & Binghamton.						
Yreka.	Montague, Cal.	Yreka, Cal.	7.5			
Zanesville & Ohio River.						
Shavnee & Musk. River.	Rendville, O.	Drakes, O.	4.5			
Zealand Valley.	Zealand Notch, Me.	End of track.	1			
Total.			3730.5			5,805

* Work suspended.

including machinery, is estimated at 1,000,000 tons, and the approximate cost is put down as 380,000,000 francs for masonry supports and 480,000,000 francs for the metallic superstructure, or \$170,000,000 in all.

Sir James Kitson, the President of the Iron and Steel Institute, stated that an eminent firm of financiers in Paris, who, as he said, could finance any scheme they had a mind to, had undertaken to furnish the money if the consent of the two governments could be obtained. Many of the iron men, dazzled by the prospective share of a demand for 1,000,000 tons, spread over ten years, immediately supported the scheme; but Mr. Daniel Adamson, Past-President of the Institution, spoke in favor of both the tunnel scheme and a continuation of the present dependence on steamers for communication between England and the Continent. The old fear of an invasion, that seems never permanently to leave an Englishman's mind, was brought up, there seeming to be doubt as to whether a tunnel could be flooded or a bridge span blown up with the most certainty. But in spite of these objections *Engineering* thinks the Channel bridge has come to stay, as a project at least. It is said that "the system of girders to be employed is simple unaltered trusses, so as to insure the proper distribution of all stresses. The secondary beams provided are intended to reduce the length of certain members, to prevent buckling of braced beams, and to give those employed as struts proportions suitable to the lengths concerned."

This statement of the design, showing as it does an abandonment of the cantilever, will interest American engineers, particularly as Messrs. Fowler and Baker are consulting engineers and are understood to have indorsed the plans. The spans will vary from 1,640 to 328 ft. in length, depending on the depths of the foundations. The level of the roadway will be 236 ft. above mean low water, or nearly 60 ft. above the bottom chord. The bridge will be double tracked, the width of floor being 26 ft., though the distance between the trusses will be, in the longer spans, 82 ft.

It is proposed that the piers shall be started on the tops of caissons, to be commenced in dry docks of small depth, floated into a harbor, where an iron case for the masonry will be added to the caisson, and if the required height is so great that the construction cannot be completed in the harbor, it will be towed to the side of a pier already in position and there completed. The extreme dimensions of the caisson for the deepest foundation will be 187 x 105 ft., and the area 17,265 ft. It is to be 6½ ft. high and divided into compartments of some 600 sq. ft. in area. The metal casing, which will be attached to the caisson, will, with its bracing, form a part of the pier; it is proposed to first lay some six feet of concrete on the deck of the caisson, and on that rough quarry stones in cement will be laid to low-water level, with two courses of cut stone every 14 ft. to equalize pressure. The area at this height will be 10,333 sq. ft. From low water up the masonry will be granite, ending at a height of about 60 ft., with a number of courses intended to distribute the load of the columns on which the bridge will rest. The area at this point will be 7,007 sq. ft. The volume of masonry will be 75,000 cu. yds. The total pressure on the foundations is estimated at 894 tons per square foot, and it is thought that the chalk will stand this.

It is expected that the caissons, with the casing for the masonry, will be floated to position and sunk, being held to

position by numerous barges equipped with hauling tackle, and securely anchored.

The entire paper has not yet come to hand, but there seems to have been no thoroughly developed plan for leveling the bottom at the maximum depths, the experience gained as the work progresses being relied on. It is proposed to fill the compartments with concrete by one uninterrupted operation. This implies making a batch of about 160 cu. yds. of concrete, getting it into a tube and discharging it into a compartment under pressure before it has time to set.

The use of compressed air will probably have to be dispensed with, and some modification of the open caisson, first adopted on the Foughkeepsie bridge and afterwards used on the Hawksbury bridge, will have to be adopted if the bridge is built.

Notes on American, English and Indian Track Practice.

On most points pertaining to railroads considerable diversity of opinion exists, and what is considered good practice on one road is not tolerated on others. Diversity of practice and uncertainty as to what is the absolutely best practice are especially to be found in the construction and maintenance of permanent way, and this is, notwithstanding the fact that roadmasters, permanent way inspectors and engineers of maintenance of way are perhaps the least prejudiced of all classes of railroad men. But they have comparatively few chances to exchange ideas and discuss the questions which perplex them with others in the same line of duty. The late Mr. Latimer, on more than one occasion, pointed out that the vast amount of responsibility which roadmasters and supervisors had to bear rendered it very difficult for them to attend conventions, where matters connected with track could be discussed, and where they could, while expressing their own opinions, hear the views of others. The same difficulty has been experienced in England by Mr. W. L. Meredith, the founder of the permanent way "Inspectors' Institution," but it is an encouraging fact that the last meeting of this body was the largest that has yet been held; while the reports received from the Roadmasters' Association of America prove that it is steadily gaining ground and yearly increasing its sphere of usefulness.

The importance of assembling as often as possible considerable numbers of trackmen from widely separated places in conventions, where they can discuss fully all the conditions and details of their practice, is illustrated in many ways. For example, in the matter of ballast. I know from experience that it is impossible to keep track in good line and surface during the rainy season in India with loam or, as it is called by Americans, mud ballast, but I do not doubt that a considerable mileage of American railroads is maintained in fair order during the greater part of the year with similar material. On the other hand, after more than twenty years' experience with all classes of ballast, commencing with well-burnt and half-burnt brick, broken to all sizes, soft stone, such as red shale, sandstone and rotten slate; later, with vitrified clay and limestone gravel, and finally, for over ten years, with the hardest stone procurable, I am of the opinion that, both for metal and wooden ties, nothing in any way approaches black trap stone, blue gneiss and gray granite, broken into cubes, varying from ½ in. to 2 in., and all dust, chips, etc., excluded. This has been proved over

and over again to be correct, as far as Indian railroads are concerned, but it may be that the climate and other conditions in America and Europe are not so favorable to the use of stone ballast: still some of those who have voted against stone ballast have either never used it, or have had very limited opportunities of judging whether it is superior to other descriptions of ballast or not. Every one acquainted with the essential points of really good permanent way admits that drainage is of the utmost importance, and broken stone certainly allows the water to escape quicker than gravel or loam. Still, an experienced English inspector suggested that when using broken granite as ballast it should be liberally mixed with chips, the thing of all others which Indian engineers try to avoid. An Indian inspector who had his section well ballasted with stone asked for engine-shed ashes to be unloaded on top of the stone, as with the latter material alone his men could not pack the sleepers properly. In doing this he was merely following what is considered good practice on many English lines.

An Indian engineer, who some years ago made a great name by his economical methods of working, once issued a circular forbidding the opening out of the ballast at the haunches, unless in cases where it could not be avoided, as he was of opinion that by leaving the ballast undisturbed it could cake, or set, and thus keep the rails in better alignment. He also approved of chips, dust, etc., being mixed with the ballast in order to bind it together, and thus keep the road steady. He maintained this opinion unaltered for many years. When hard stone ballast was being introduced on Indian lines, the native staff were in many cases averse to its use, and, unless watched, would put small pieces of brick or soft stone under the ties, thinking they could be best tamped in this way. They have, however, discovered that since the use of stone ballast has become general their work has been greatly reduced; in fact, the writer was enabled to reduce the number of men employed in maintaining the road by 25 per cent. directly his division was fully ballasted with stone.

Some who have had much experience in track work are still loath to believe that a good road can be made with any description of metal ties. When the Denham & Olphert cast-iron tie was being discussed at a meeting of permanent way inspectors in England, an engineer who was a specialist on track matters objected to its use, on the plea that the percentage of breakages of iron ties was from 12 to 28 per cent. on Indian railroads. A little inquiry would have convinced him that the breakages to which he referred were due to placing bowl ties on a hard, unyielding roadbed. An inspector of experience also objected to this tie, and was of opinion that, in addition to being too complicated, a good road could never be made with it. The papers read at this same meeting proved that jungle coolies found no difficulty in using it, and that they were laid on lines where the fastest and heaviest trains "in India" had been running for some years. This inspector had never used any type of metal tie, but still he condemned them as unsuitable.

Even versus broken joints has also been a bone of contention for many years, but although the majority of American engineers are, I suppose, in favor of the latter, it is not conceded by all that they are superior to even joints. In England broken joints are almost unknown, and in India they have not been tried to any great extent. In the few cases where broken joints have been tried with 30 ft. steel rails and deep fish-plates, the results have not been sufficiently good to justify their being preferred to even joints. On English lines the fish-plates are, as a rule, only 18 in. long, and this allows the joint ties to be spaced 24 in. apart. To compare the results obtained on English and American railroads would hardly be fair, as the latter use only flat-footed rails, laid directly on the tie, while the former use bull or double-headed rails fixed in heavy cast-iron chairs. The weight of rails per yard is also much greater on English railroads, while the number of ties per mile is much less than on American roads; but to maintain that a first-class road cannot be made with even joints appears to the writer so absurd that he can only suggest that those who are still sceptical on this point should travel occasionally by express from St. Pancras, or King's Cross, to Manchester or Liverpool, or, better still, by one of the fast trains from Euston to the North. The heavy rails in use on these lines have, no doubt, a good deal to do with the smooth running of the fast trains, and there cannot be any doubt but that, as far as track is concerned, the best English roads are equal to any in the world, and superior to most.

Much of what has been said applies to the question of suspended versus supported joints. Many American roadmasters have recorded their opinions on this point, and the majority are perhaps in favor of a supported joint; but the best inspectors of permanent way in England and India will maintain that suspended joints make the best road. It would be wasting time to try and prove that either of them is entirely wrong. Many of the railroad tracks in America, laid with supported joints, leave little to be desired; and, as before stated, the leading English lines are always in good order, although not a supported joint is to be found on them. The flat-footed rail will give better results with supported joints than could be expected from double-headed rails laid in heavy cast-iron joint chairs. With the latter every wheel that passes over the joint helps to flatten the end of the rail, much in the same way as if it were being pounded on an anvil. Fifteen years ago a mile of track was laid with double-headed iron rails, 74 lbs. to the yard, on wooden ties spaced three feet apart. The joints were fished in the usual manner, after which a joint chair, weighing 40 lbs., was placed over the fish-plate and spiked to a tie, which was laid exactly under the joint. Under a traffic of 20 trains daily the rail

ends began to show signs of damage in less than a year, and before two years had expired the joint chairs were taken out and most of the rails turned. Even on the darkest night every man who ran over this division knew at once when he came on to the supported joints.

The length and form of fish-plates is another point on which opinions differ so much that anything like uniformity appears hopeless. Although nearly every English railroad has something special about its joint fastenings, it will be found that in the majority of cases the fish-plates have only four holes, and although a few companies use plates 20 in. long, the usual length is only 18 in.; the weight varying from 20 to 50 lbs. per pair. This agrees pretty nearly with Indian and Australian practice, although a few railroads are trying plates 26 in. long and 5 in. deep, with six bolts. On American railroads the length of fish-plates appears to increase every year, and many companies are now using plates from 42 to 48 in. long. If the light section of the rails used in America are not in some way responsible for the necessity of such long plates, it is difficult to understand how such perfect track is maintained in other countries where only short plates are used. The writer is of opinion that a short bridge joint will make a better road than any form of angle bar. Messrs. J. & G. Bell, of the North British Railway, have invented an improved fish-joint, which, without being unwieldy, gives good results, far better, in fact, than many which are both longer and heavier. It may be classed among bridge joints, as the rail ends are prevented from deflecting by a bottom plate which fits into slots in the side plates. This form of plate is, however, not receiving the attention it deserves, although by its use the fish-bolts are relieved of considerable strain, and the rails are allowed to expand and contract freely without in any way impairing the strength of the joint.

There can be no doubt that the cost of maintenance is greatly enhanced by the use of so many different types of material. In most countries the question of all railroads eventually becoming the property of the state has at some time or other been mooted. Probably when this occurs, if it ever does, they will not be so well managed as they are now, but, by amalgamating the several systems a more uniform system of working would perhaps be possible, and this would certainly be no small advantage.

Even in India, where the state, through its consulting engineers, exercises a considerable amount of supervision and control, there is a great difference in the systems in vogue on the different guaranteed railroads, and even on some of the state lines. This has been condemned by many able men, and although the conferences, which are held every two or three years, have done much toward removing the anomalies which at one time existed, a great deal still remains to be done before a reasonably uniform system of working will be established. The evils of the present system were never more apparent than during the war scare of 1885, when Russia was thought to be advancing on Kandahar, and the railroad to the Bolan Pass was being pushed on with all possible dispatch. Very little material being available in the government stores, the different railroad companies were asked to lend materials and men, but in many cases the former was of little use, owing to the number of different patterns sent. An inspector would probably receive 1,000 ties suitable for the Vignoles rail, but the only rails supplied to him were double-headed. Fish-plates with holes $\frac{1}{8}$ of an inch diameter were available, but the only fish-bolts to be found were 1 in. diameter. In other cases, after laying 20 miles of double-headed rails weighing 82 lbs. per yard, a consignment of Vignoles rails would be received, followed by some double-headed rails 65 lbs. per yard. The confusion that ensued can be better imagined than described, and in addition to the time lost and material spoilt, the greater part of the line had eventually to be pulled up and relaid. In a country like India, where war may break out at any moment, and where famines have to be dealt with at a very short notice, the danger and inconvenience which may some day result, owing to the government not being able to concentrate the whole of its resources, is especially noticeable, and the same reasoning applies more or less to every country where the appliances in use on railroads are not interchangeable. Where good reasons exist for the use of different types of material some latitude must of course be allowed, but in many cases no reasons can be given, and no evil would result or inconvenience be experienced from the introduction of fixed standards for everything.

RAILROADER.

Mr. Dorsey on American and English Railroads.

At the September meeting of the British Association Mr. Edward Bates Dorsey read a paper on American and English Railroads Compared. We shall not reproduce much of what he said, because it was merely stating, in somewhat changed language, what he has already said at various times and in various forms, and especially in his well-known book on the subject. Mr. Dorsey made one statement, however, which should not pass unnoticed. He said, "In the United States railroad practice it has been found that the tubular iron car is the best design in use, combining as it does a minimum of dead weight and of wear and tear, with a maximum carrying capacity, etc." This statement is liable to convey to the English reader a very wrong idea of the extent to which the iron tubular car is used in the United States and of the standing which it has attained in the estimation of mechanical officers of railroads. As a matter of fact, although the introduction of the car has been rapid and successful, the number of such cars in use in the United States, when com-

pared with the great volume of freight car equipment, is really very small.

We make the following quotations from Mr. Dorsey's paper:

"The following are the principal reasons that have been given by the English railroad officials why the American practice cannot be adopted here, or why the English railroad charges are so much higher.

"The author gives his answer to each objection.

"1. The impossibility of using on the short English turntables the long American freight car.

"Answer.—From the author's investigation, he is safe in saying that on the average less than 5 per cent. of the wagons now used in England go on the turn-table. Moreover, some of the present small wagons could be retained for their turn-table traffic. With properly constructed sidings, freight on the long bogie-truck car can be handled much quicker and cheaper than on the short wagon by the use of turn-tables. In the American practice, where is found the cheapest freight charges in the world, turn-tables are never used except for the purpose of turning locomotives.

"2. The present plan of the English stations and sidings would have to be changed to accommodate the long freight car.

"Answer.—This would apply only to stations where turntables are used. A very important item in favor of the long and high-capacity car is that it only requires about half the station or siding room that the short English wagon does in order to handle the same quantity of freight. The standard American car is 34 ft. long and loads 30 tons; the present English wagon is 18 ft. long and only loads 7 to 10 tons.

"3. The adoption of the American practice would mean a radical change, and would be virtually a reconstruction of the English rolling stock.

"Answer.—This is to some extent true, but the transformation must of necessity be gradual, as by building 75 cars per day for 300 days each year, it would require 25 years to replace the present rolling stock. All the new rolling stock required could be made on the American principle, and as the present wagons come into the shop for extensive repairs, the wheels and axles of two of them, if in good condition, could be placed in the bogie trucks of the new car. All the principal American railroads have found it advantageous to change and remodel their practice entirely in the last 15 years, during which time the carrying capacity of the freight cars has been increased from 10 to 30 tons paying load, decreasing the proportion of tare weight, and the weight of locomotives has been increased from 30 to 60 tons, and the roadbed, superstructure, bridges, etc., have all been strengthened to carry their increased load safely.

"4. It is frequently stated that it is impossible to use the large freight cars in England, owing to the great number of small shippers, who require a car exclusively for their small shipments, even when the quantity is much less than a car load.

"Answer.—This difficulty is easily overcome on the American roads by running a special train that distributes and collects all local freight when in small quantities, the same as milk trains now do on some of the English roads. Moreover, 72 per cent. of the total tonnage of the freights handled in the United Kingdom are minerals; surely they can be sent in full car loads, and the large cars could be used for this traffic if it were not for the small shippers.

"5. The freight traffic being largely in one direction compels the movement in return, of many empty wagons.

"Answer.—77 per cent. of the total tonnage mileage of the Pennsylvania Railroad is eastward and only 23 per cent. westward. It is doubtful if any railroad in England that is not exclusively a mineral road can show so great a disproportion.

"6. The heavy terminal charges and expenses upon English railroads compel high rates for freight.

"Answer.—All the station and service terminal charges as given in the 'Maximum rates and charges' can be deducted, still leaving a very high freight charge, or by deducting from the English cost all traffic charges (coaching and merchandise) amounting to 36 per cent. of the whole operating expenses and deducting nothing from the Pennsylvania Railroad, the English charge is still 62 per cent. greater than the American.

"7. Many persons think that the English railroads are operated cheaper than the American, because the cost of the train-mile is about 30 per cent. less than it is on the American roads.

"Answer.—When proper allowance is made for the difference in the train-load the American road does the same work at much less cost, for example the average freight train on the Pennsylvania Railroad transports 214 paying tons at a cost of 42.06 pence, while on the London & Northwestern the average cost is 33.25 pence, only transporting 79 tons. By making proper allowance for the load of trains, the percentage against the London & Northwestern is 114 per cent.

"8. It is said that the English railroads are operated cheaper than the American, because their operating expenses when compared to the total earnings are much less.

"Answer.—This is very misleading. If proper allowance be made for the difference in the charge for transporting one ton one mile the advantage is greatly in favor of the American roads. On the Pennsylvania it would be only 20 per cent. of the whole operating expenses, and 160 per cent. against the London & Northwestern.

"The author has professionally examined a new railroad route from a large interior manufacturing town and district of England to good docks on the coast, and finds that this road would not cost to exceed £10,000 per mile, allowing liberally for land, damages, etc., and could pay good dividends by transporting freight at less than half the present charges. This road would be built entirely for freight; the present passenger accommodation being considered ample and satisfactory.

The author is convinced that a great many cheap freight railroads could be constructed in England that would pay good dividends on the investment, and transport freight at half the present charges. This alone would double the value of farms, and would be a boon to the miner and manufacturer in their present close competition with foreign countries."

Explosive Mixtures of Air and Vapor of Petroleum.

Numerous explosions on petroleum ships have occasioned experiments to determine the conditions necessary for assuring safety. It has been found that a mixture of one volume of petroleum vapor with five volumes of air is practically safe. If there are six volumes of air, the mixture is slightly explosive. When there are from seven to nine volumes of air for one volume of vapor, a violent explosion may occur, increasing in violence if there are 12 volumes of air, while with 16 volumes of air the mixture is so much diluted that there is little danger of explosion, and is absolutely safe if there are 20 volumes of air to one volume of petroleum vapor. Inventors may find that these experiments are suggestive. Let them provide some means of obtaining a safe mixture, if the petroleum cannot be tightly confined; or, failing this, they might devise an instrument to show the quality of the mixture at all times.



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EDITORIAL ANNOUNCEMENTS.

Contributions.—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and in their management, particulars as to the business of railroads, and suggestions as to its improvement. Discussions of subjects pertaining to ALL DEPARTMENTS of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.

Advertisements.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

In this issue will be found a table showing the new construction of railroads in the United States for the first nine months of the calendar year. The total for the United States is 3,110 miles and for the United States, Canada and Mexico 3,750 miles. It appears from these figures that the rate of building in 1889 as compared with 1888 has improved in the third quarter. In the first and second quarters only about half as much new road was built as for the corresponding periods in 1888. At the end of the third quarter we find that the proportion has risen to about three-fifths. This was foreshadowed at the end of the second half year, when the amount of line reported as under construction was quite as great as it had been in the preceding year. Reasoning by proportions only, the amount of railroad built in the first half indicated a total new construction of 3,500 miles in 1889. The figures for the three-quarters of the year used in the same way indicate 4,200 miles of new main line for 1889. Writing on this subject three months ago, we said that, considering the condition of business and of the market for securities, it seemed likely that some of the lost ground would be regained. That, we see, has been the case. More new road has been built in the third quarter of the year than was built in the first half. In six months the new construction amounted to 1,480 miles; in the three months to Sept. 30 it was 1,630 miles. There is excellent reason to think that the last three months of the year will show even a greater new mileage; but if it is no more the total for the year will amount to 4,600 miles. A new mileage for 1889 of 5,000 miles is not at all an unreasonable estimate. The last three years have accustomed us to such large figures that this seems a small increase, and it is much smaller than the average for the last 10 years, which has been about 7,600 miles a year; but it is enough for the basis of a good business, and it is more than could have been confidently expected early in the year. The amount of road now reported as under construction is about 5,800 miles against about 4,450 three months ago. This again, so far as it goes, indicates that there is not likely to be any falling off in building in the last quarter of the year. The Southern states east of the Mississippi still contribute much more to the total amount built than any other section, viz., 44 per cent. In the first half year this group built 45 per cent. of the whole. In 1888 they built 31 per cent. The Northern states east of the Mississippi have built 20 per cent. against 17 per cent. in the first half year. The Southwestern states, with Kansas and Colorado, have built 19 per cent. against 24 per cent. in the first half year. The Northwestern states contribute about 6 per cent. and the Pacific coast 11 per cent. of the new mileage so far built.

In a recent article concerning "red tape" on railroads we referred to the necessity of care and intelligence on the part, not only of railroad officers, but of

station agents and all employees upon whom devolves the duty of asking or answering questions by letter to the end that their utterances shall always be of the clearest character. General Spinner's standard, requiring every communication to be adapted to the comprehension of the most ordinary intelligence, is a good one. An illustration of this point is afforded in the first decision printed in our Railroad Law column this week. It will be seen that the essential error causing the litigation referred to was in the Cincinnati man's failure to explicitly tell the Springfield man that the latter had made a mistake. Instead of doing this, the telegram simply gave a hint by which the man was expected to discover his mistake himself. The fourth and sixth decisions in this week's list cover points of special interest to freight traffic men. The decision of the New York Supreme Court seems to disclose an unjust feature in the requirements of Grand Trunk bills of lading. To demand that a consignee in Albany should notify the Grand Trunk at Suspension Bridge of a concealed damage on a shipment from Chicago, and do it within 36 hours after the shipments start from Suspension Bridge, is virtually requiring him to give the notice before he receives the package. Of course, the New York Central cannot give the notice, because it has not discovered the damage. The requirement laid down by the court, that a contract extending over foreign roads is subject to precisely the same limitations on those roads as on the line of the originating company, seems eminently sensible. A road cannot contract to be relieved of the consequences of its own negligence: why should it be permitted to hinder the consignee from getting his rights with equal facility from another road? A road cannot contract to be relieved of the consequence of its own negligence; why should it be permitted to hinder the consignee from getting his rights with equal facility from another road? The fifth decision will remind traffic men of the importance of seeing that all roads, and especially their more immediate connections, pursue systematic methods in receiving freight from shippers. If roads desire to avail themselves of the numerous protecting clauses now common on bills of lading—and these clauses often prove of value to a road—it is to their interest to see that the practice of receiving important shipments without issuing a receipt, or on the issue merely of a brief unconditional dray ticket, be abolished as effectually as possible all over the country.

The Superintendents, whose association now becomes the "American Society of Railroad Superintendents," met this week and had a good time; and our report, printed in another column, shows that they considered many interesting things; but still the attendance is not encouraging, and the organization fails to fulfill its mission. Why members do not take more pains to attend is not exactly clear; but undoubtedly one reason is the old one, that nearly every one comes to get information and very few to impart it. When some one gets a half-dozen thoughtful superintendents to present good papers on as many live subjects, which are of interest to superintendents, and have not been discussed by the roadmasters or master mechanics, or some other body, we shall doubtless see a change. Subjects are not wanting. The easy manner in which the Time Convention dismissed without discussion a number of topics which should be burning questions among railroad managers and superintendents shows that there is room enough for a superintendents' association, if it will only rise to its opportunity.

The Time Convention.

The fall meeting of the General Time Convention was held at the Hotel Brunswick, New York City, on Wednesday of this week, and one session of less than three hours sufficed for all the business that was done. A report of the proceedings will be found on another page. On the recommendation of the Executive Committee the convention adopted without discussion a rule which provides that the membership of all committees to be hereafter appointed shall be by companies, the superior officer of the operating department to be the individual member of the committee, unless he shall designate some subordinate officer of his company to serve. The fact of this rule being adopted by the convention without discussion leaves a bare suspicion that its full force was not appreciated or fully understood by all of the representatives present. The most important achievements of the Time Convention thus far have been accomplished through the labors of its committees, the members of which have been selected by the convention with especial reference to individual fitness for the work to be undertaken. In many instances the roads are not

represented by the superior officer, and the effect of this rule must be, to a certain extent, to take away the power of the convention to form the most efficient committees for special work, as it will have no positive knowledge as to the personnel of the committees it may appoint. The superior officer may disappoint the expectations of the nominating committee by excluding a subordinate especially fitted for the duties imposed; or, on the other hand, a natural diffidence or the pressure of other duties may often lead the very capable superior officer, whom the nominating committee may have had in view for the purpose of adding strength to the committee, to escape committee work by the substitution of a subordinate not nearly so well fitted for the duties as himself.

The action of the convention in appointing a "Committee on Safety Appliances" is to be highly commended simply as an indication of the purpose of the convention, whatever may come of it. The field, however, is a wide one and the special line of investigation had in view does not appear; but a full and intelligent discussion of these topics by men who have both knowledge and authority, as distinguished from those who have only the former (or whose authority over expenditures is of the most limited nature), cannot fail to be of great value.

By far the most important business before the convention was on the question of devising ways and means for the improvement of car service. In this respect the action of the convention was very disappointing. Recognizing the urgent necessity of reform in this branch of railroad service, this body undertook, about two years ago, the work of bringing it about. A committee on car mileage and per diem rates was appointed, with instructions to investigate the subject and recommend a plan by which the service could be improved. The investigations of this committee showed that the average performance of freight cars interchanged is only about 24 miles per car per day; or, in other words, that the freight cars in this country stand on side tracks 22 hours out of every day, and further, that the service is steadily growing worse. The necessity for reform is largely attributable to the imperfections of the simple mileage system of settlement for the use of cars interchanged, which system was put into use when cars were first interchanged between different roads and before the conditions of the present day began to be foreseen. The principal objection to the straight mileage plan is that it provides no incentive for quick movement and prompt return of cars to their owners, but rather invites delay, there being no tax so long as the car stands still. The first object, therefore, of the committee was to introduce a per diem charge for the use of cars in addition to the mileage rate, which would serve as the necessary incentive to prompt movement and quick return of cars to their owners. The per diem plan was tried for about six months on a number of roads, including all of the trunk lines except one, and was found entirely practicable in operation, but was finally discontinued on account of increased cost to certain roads. This increased cost, however, was largely due to the unreasonable detention of cars by consignees, an evil which must be overcome before reform can be accomplished. The principle of per diem charges for cars interchanged is generally admitted to be a correct one, but that the railroads should not be compelled to suffer unduly through the tardiness of shippers and consignees in releasing cars the committee recommended the adoption of a system of detention charges, to be paid by consignees who should detain cars longer than 48 hours. The service of the cars owned by the roads giving the per diem plan a trial showed an increase of seven miles per car per day in the six months, which was equivalent to an addition of one hundred thousand cars to the equipments of the roads interested. The plan of detention charges as recommended by the committee has also been tried successfully, and is to-day producing most gratifying results at a number of large business centres.

The work, therefore, of the Committee on Car Mileage and Per Diem Rates, in providing the way to car-service reform, we may say, has been well done. The failure of the convention to make any practical use of the means is the disappointing feature of the case. Six months ago the convention passed a resolution to put a system of uniform detention charges into effect from Nov. 1, 1889, and another to put the mileage and per diem system into effect from Jan. 1, 1890; but now the convention has undone its work and refused to take the step it had prescribed for itself. There was nothing brought out to indicate that there is any less necessity for reform now than two years ago, or that any better plan for accomplishing the reform than that recommended by the committee has been thought of. What, then, is the trouble? Do the operating officers lack the authority to correct an evil which they know to be wide-

spread and growing; if so, why? Is it due to the opposition of the traffic departments, or to the want of a clear understanding on the part of the executive officers of the magnitude of the evil and the possibilities of reform? It is generally conceded that with proper movement there is a sufficient number of cars already in service to handle the present traffic; but notwithstanding this fact the total number of cars is being increased at the rate of about 30,000 per year at a cost of about \$15,000,000. These 30,000 cars at the present rate of performance make not more than 273,750,000 miles per year. According to Poor's Manual, there are now 1,005,116 freight cars in service. An increase, therefore, of only one mile per car per day on the cars already in service would more than equal the performance of the 30,000 new cars. Is there any member of the Time Convention who doubts that the introduction of the reform measures recommended by the committee would not increase the performance of cars five miles per day from the very start? This would be equal to 150,000 cars added to the present stock. Under these circumstances the fact that the movement toward car-service reform has made no progress in the Time Convention must apparently be attributed to a lack of interest, or a failure to fully grasp the situation, on the part of a large majority of the individual members; and, in fact, evidence of this condition of affairs has been apparent whenever the consideration of the question has been before the convention.

If there is opposition to the reform by the traffic department it must be overcome. If the executive officers are not fully conversant with the causes of the evil and the great magnitude of the economy to be accomplished, it is the duty of the subordinate officers to labor with them. Probably one great influence restraining many managers who recognize the value of the proposed systems is the feeling that negotiations with other roads concerning the distribution of the burdens resulting from idle cars (cars now constantly in use) will be difficult and interminable. By the present system losses resulting from wasteful use of cars are concealed; with a per diem system they would be brought to light and would be definitely placed upon some one. The fear is, not that this process would place the burden unjustly, but that it would place it differently. Managers seem to fear a change, without stopping to consider whether its ultimate effects will be beneficial or not. Each one desires to have justice done, provided justice is, for the present, on his side. But it is by no means certain that these supposed difficulties will be so imposing as they seem. The expected difficulties with consignees have been overcome more successfully than many had dared to hope. This should impart courage. If the Time Convention is too unwieldy a body, it is to be hoped that the associations—the trunk lines, for instance—will consider the matter. Whatever is done, however, every manager should see that his own individual interest, in so important a question, does not die out.

Locomotive Counterbalancing and Permanent Way.

A communication in another column brings up again the matter of a starting engine for locomotives having cranks located at 180 degrees, for the purpose of removing the larger part of the counterbalances. In a previous issue we have disposed entirely of the question of the amount of power required in such a starting engine, and this part of the subject can, therefore, be dropped from further consideration. There is, however, one point which has not been satisfactorily considered, that is, the means of obtaining the necessary strength in the connection between the barring engine and the drivers of the locomotive, whether that connection be a frictional one or made with gears. Nevertheless, it is not the intention to discuss that point now, as it is hardly of immediate interest. But it may be well, in order to straighten out what seems to be a little tangle in the dispute on this subject, to state the advantages of putting the cranks at 180 degrees and the difficulties in the ordinary arrangement which such a disposition might eliminate.

So far as the advantages have been brought out, they consist almost entirely of an improvement in counterbalance. At present locomotive drivers are badly counterbalanced, and there is no apparent remedy in the direction of a different location of or a different amount of counterbalance. That is to say, there is no remedy in these directions as long as the reciprocating parts keep their present dimensions and weights. Probably no other feature of the design of a locomotive has received so much attention from mathematicians as the question of counterbalance, and we have reached the limit of mathematical assistance. Exhaustive in-

vestigation of the subject during the past year has shown that the best of the present systems of counterbalancing are in conformance with the true theory of the subject, and if any improvement is to be made in the rules in use at present it must be made with a premise that the perfection now demanded in minimizing what is called the "nosing" and "jerking" of the engine will be waived, and preference given to the reduction of the effect of the counterbalances upon the roadbed. Experiment and calculation have proved that

(a) A revolving body can be made to exactly balance a reciprocating body, under the conditions of locomotive construction, except for the inaccuracies produced by the angularity of the connecting rod.

(b) The inaccuracies produced in counterbalancing a reciprocating part by a revolving part, under the conditions of locomotive construction by the angularity of the connecting rod, are not of sufficient magnitude to require special consideration, unless it be to so proportion the counterweights as to make them a mean between the extremes required to perfect the balance during the variations of the forces to be counterbalanced caused by the angularity of the connecting rod.

(c) The most accurate location for the counterweights is not directly opposite the crank, but at some angle therewith, depending upon the location of the centres of the counterbalances and centre lines of the cylinders.

Having determined the possibility of an exact counterbalance of reciprocating parts, that much of the problem is settled. After this the mind naturally recurs to a consideration of the necessity for an accurate counterbalance, hoping in this direction, perhaps, to avoid the existing evils. Those who are familiar with improperly balanced engines in operation, particularly those where the counterweights are insufficient, know that at high speeds the engine tends to leap forward and backward at every revolution, and this difficulty grows greater as the speed becomes higher. It is reasonable to suppose that if all counterbalance for reciprocating parts were omitted from the driving wheels no difficulty would be experienced in driving a locomotive at slow speeds; that is, it would neither jump nor jerk, but immediately, if the speed be increased, a violent oscillation would be produced. This, in an exaggerated degree, represents the condition of all locomotive engines at the present time. The increasing speeds have demanded a more perfect counterbalance of reciprocating parts to reduce the nosing and jerking of the engine, and the increased perfection of balance has demanded greater counterweight; and if it were not that this increase of counterbalance has commenced to destroy the roadbed, it would only be necessary, in order to meet the more accurate balance demanded at the highest speeds, to increase the weight of that portion of the counterbalance intended for the reciprocating parts, and the locomotive, as far as the nosing and the jerking is concerned, would ride with almost perfect steadiness. But we have reached the limit of allowable unbalanced weight in a driving wheel. This term "unbalanced weight" is correct, because a locomotive driving wheel, when properly balanced to resist the action of the reciprocating parts, is always of itself unbalanced, and it is because of this that it destroys the track; hence it readily appears that the greater the perfection of balance demanded in the locomotive, the larger will be the unbalanced weight in the driving wheel, and, therefore, the more disastrous the effect upon the permanent way.

It is to obviate the necessity of having an unbalanced weight in the driving wheel that the plan which embodies the use of cranks at 180 degrees has been suggested; but it would seem that in doing so two important features of the question had been neglected. The first, and most important, is whether it is not possible to reduce the amount of the unbalanced weight in the driving wheels necessary to keep the engine from nosing and jerking without resorting to a radical change in design or method of construction. The second is a lack of appreciation of the increase in the tendency to these movements caused by a location of the cranks at 180 degrees unless the reciprocating parts of the locomotive be made to exactly counterbalance each other, without leaving a resultant force tending to rotate the locomotive about a vertical axis passing through its centre of gravity. Such a rotation would be produced by any design having two cylinders, one on each side, or four cylinders, with two on each side, unless they were arranged in a plan similar to that of the well-known Shaw engine. It is possible to produce the desired balance by the use of three cylinders, one in the centre of the engine and two on the outside. Slight modifications could be made on these designs without affecting appreciably the accuracy of the balance, but, in the main, the designs would have to approach nearly to one of these types

unless a very radical change in the present form of locomotive was to be made.

Regarding the first neglected feature of this subject, as before mentioned, there is much which can be said and ought to be impressed upon locomotive designers. It hardly seems logical or reasonable to be wrestling with a difficult problem or looking about for new ways of removing present difficulties when there are lines of improvement to be followed which are simple and easily comprehended. As an illustration of this, attention may be called to one of the methods of reducing the difficulties in counterbalancing, to which but little attention seems to have been paid. It lies in the direction of the use of lighter reciprocating parts. This might seem to be a severe criticism on the present methods of design if it were not within the knowledge of most railroad men that locomotives performing the same service, of almost identical weight, and requiring precisely the same strength and details, are now running, and are now being constructed with reciprocating parts which vary in weight at least 50 per cent., yet the lighter construction, even with the same material, shows but little, if any, evidence of weakness, and there is no strong reason to believe that the weights of reciprocating parts cannot be further reduced, using the present material; and, if a better class of material were used in place of the kinds now almost universal, we might expect a large reduction in dimensions necessary for those parts. Instances are easily pointed out of 18-in. pistons $4\frac{1}{2}$ in. thick, and in other cases $6\frac{1}{2}$ in. thick, both for the same style of locomotive, and of main rods that are twice as heavy in one case as in another for the same class of work, and of crossheads that could readily be reduced from 10 to 25 per cent. in weight. All of this possible improvement, before it becomes necessary to alter materially present designs, is not without precedent. Inferior as are Continental and English designs, in many respects, to our own for our use, and absurd as seems the complexity of the French locomotive, yet such engines are generally in this matter of the weight of the reciprocating parts of superior design to our own. The pistons are made thin, either of cast steel or of wrought iron, and the connecting rods smaller than we would at the present time believe capable of doing the work demanded in American service.

The truth and force of all this will, perhaps, be appreciated when it is stated that a 10, 15 or 25 per cent. reduction in the weight of reciprocating parts—not a large amount to obtain in many cases, even where now loud complaints are made regarding the effect of locomotives at high speeds on the permanent way—means a corresponding reduction in the damage to the rails and roadbed at the present speeds, or a large increase in permissible speed without increasing the damage beyond that at present suffered. Just what the limit of speed is which we can reach without radical change in general design, through the medium of a reduction in the weights of reciprocating parts, it is almost impossible to declare; but we may rest assured that the time has not arrived when the speeds demanded of railroad trains in general, or even of special trains, is so great as to prevent its accomplishment with the present general types of locomotive on account of the necessary unbalanced weight in the driving wheels; and the movement which is now being made in several quarters in the United States to reduce the weight of reciprocating parts leads us to believe that such a step will be the one taken with a view to diminishing the damage to the permanent way before a radical change is made in the general types.

The Power of Traffic Associations.

At a recent meeting of the Inter-state Commerce Railway Association, Mr. Ashley strongly urged that more power be given to the arbitrators. At present, any road can set aside an award as to rates by simply giving the necessary notice of a reduction. Mr. Ashley would have the award made final and binding instead of provisional; and many other members of the Association seem disposed to agree with him.

But such a course involves serious difficulties. In the first place, it is somewhat questionable whether an agreement of the kind proposed could be enforced if any road wished to break it. But apart from the danger of such open violation, there is a still greater danger of evasion. If a road is forced to accept an award which it does not like, it cannot be expected to lend any very active aid in enforcing it. To make compulsory arbitration effective, there must be some authority strong enough to see that its terms are complied with. In our traffic associations to-day such an authority does not exist. The experience of the Missouri River roads this week furnishes a marked instance in point. One road, which was charged with cutting

rates, replied by a whole series of counter-charges. If the newspaper reports can be believed, scarcely a road has its hands clean. Rebates seem to have prevailed everywhere; unreported cars are numbered by the thousand.

So long as such a state of things is possible, the nominal power of an arbitrator is of little moment. The more stringently binding his decisions are made, the greater will be the amount of evasion. Reform must begin at the bottom. To make a traffic association serve its purpose the prime necessity is a means of securing full and accurate reports of freight movement. If this is insured it furnishes a basis for everything else. If it is absent all other arrangements rest on an insecure foundation.

Next in order of importance comes the machinery for preventing secret rebates. This is more essential now than it was before the passage of the Inter-state Commerce law, because the roads are forbidden to divide traffic. The chance for foul play in the matter of rebates is thus increased, and the chance for mutual suspicion vastly increased. As yet we have no machinery for avoiding dangers of kind. The Inter-state Commerce law is supposed to prevent them; but in practice it proves sadly inadequate for the end in view.

When these objects are accomplished there will be a chance to give really effective power to an arbitrator. There can be no doubt that the ideal traffic association would have such powers as Mr. Ashley advocates; but the mere grant of such powers under existing circumstances would, we fear, be no gain. It would be an attempt to build from the top instead of the bottom. We have had too much of this already. The Inter-state Commerce Railway Association has suffered from this cause all along. It was established under the idea that the terms of an agreement were more important than the machinery for executing them, and that it was more important to have a contract signed than to know how it was going to be carried out. We have been suffering from this error ever since. Any attempt to increase nominal powers as distinct from real ones seems likely to intensify the evil rather than lessen it.

This state of things is not confined to traffic associations. It extends to the whole matter of railroad regulation. We are suffering from the assumption of too many powers with too little power. As long as the Inter-state Commerce Commission tried to enforce the plainer meanings of the law against the worst forms of discrimination, it did extremely well. When it tried to draw the lines tighter, it increased the dangers of evasion, until finally, toward the close of last year, the Commission suddenly awoke to a realizing sense of the facts in the case. There is danger that those who advocate the extension of authority on the part of traffic associations, without a corresponding power to enforce these decisions, will make the same mistake.

A New Plan for Raising Money.

Fifteen or twenty years ago, when a railroad manager wanted money, he issued more bonds. This plan was carried to such an excess as to produce a reaction. Investors became shy of purchasing junior securities whose proceeds were to be used for uncertain objects. Even the long-suffering stockholder began to protest against the attempt to burden him with too many mortgages. The soundest of roads could not go on continually increasing its indebtedness without giving its stock a highly speculative character.

Of late another plan has come into vogue. If the stock of a road stands well above par, the stockholders are only too glad of the chance to subscribe for new stock at its face value. In this way the available funds can be largely increased without running into debt or making the investment a speculative one. But such a course is only possible when the stock is very high. If it stands below par, this plan is out of the question; if it is only a little above par, it is somewhat hazardous. The attempt to market new stock may so increase the supply of a certain line of securities as to depress their selling price, independently of changes in the value of the property itself, and thus drive a stock below par which formerly stood slightly above it. If new stock were offered to stockholders at 50 instead of at par, this danger would be obviated. A road whose stock is selling at 100, which offers new stock at 50, has the same power of compelling its stockholders to contribute money as one whose stock is selling at 200 which offers new stock at par. But no railroad would dare or even wish to do this openly, nor would the law allow it if it were attempted.

The project devised by the management of the St. Paul, Minneapolis & Manitoba seems to embody an effort to do this same thing indirectly. The stockholders are to be given an opportunity to subscribe for pre-

ferred stock of the Great Northern, a new corporation—or rather an old one with new life—paying \$50 on each \$100 share of preferred stock. To this company the St. Paul, Minneapolis & Manitoba will transfer securities which it now holds, to the par value of \$22,000,000; a little more than half of these securities being already subject to a special lien under the collateral trust mortgage for \$8,000,000. The company thus formed will pay and cancel this collateral trust mortgage; and will then lease the entire system of the original company, guaranteeing a rental of six per cent., free of taxes, for not less than 99 years, and assuming all taxes and interest obligations of the original company.

Let us now see what is the position of a Manitoba stockholder who does not wish to go into the new arrangement. He has given up:

1. The control of his property.
2. All chance of dividends above 6 per cent.
3. The excess value of \$22,000,000 securities above \$8,000,000 collateral trust bonds.

In return for this he has received only a right of action, of a kind not altogether easy to enforce, against a corporation whose financial standing will be at first chiefly due to the advantage which it has obtained against him in the original bargain.

If the project is allowed to go through it will practically compel the Manitoba stockholders to come into the arrangement, because the disadvantages of staying out are so great. Whether the law will allow such a plan to be carried out seems, at least, questionable. We should speak still more strongly on this point did we not take it for granted that the management had taken all the legal bearings of their action into careful consideration. What they intend to do with the money when they get it no one seems to know. With the experience of other roads before them, it does not seem likely that they will try to build a Chicago connection of their own. A consolidation with some existing line is, on the whole, a more likely alternative.

Judged as a matter of finance, the plan is not altogether straightforward. Under the pretense of giving a fair bargain it really makes an unfair one; and the fact that any stockholder who chooses to do so may get the benefit of this bargain is only a partial justification. The same thing might have been said in palliation of the old Credit Mobilier on the Union Pacific. On the other hand, the authors of the present plan seem to have calculated pretty well on the temper of the market. The stock, while fluctuating widely, has on the whole gone up. The average man is so dazzled by the prospect of buying \$100 for \$50 that he is apt to be enthusiastic over the chance of purchasing it from himself on those terms.

Safe Rules for Delivering Train Orders.

Railroad officers often should take more pains than they do to defend themselves and their ways of working. The public gets wrong impressions, these impressions are exceedingly tenacious, and the railroads suffer from them. It is incumbent upon superintendents and traffic men, as well as upon general managers and presidents of railroads, to do what in them lies toward correcting these erroneous views. In many cases, where a railroad is at fault in its dealings with the public, the responsibility for the fault is divided among different officers or departments, and so each officer shrinks from saying anything that will injure his co-workers, not to mention the motives he may have for reticence on his own account. Again, the public will blame a railroad, say, on three different counts for certain accidents or mistakes of policy, when two of the counts are based on false premises and only one is founded on real grounds. In this case the officer quite likely feels so mortified concerning the point where he clearly recognizes the fault in his own department that he has no heart to make a defense of the other points, wherein he is unjustly accused.

These reflections are drawn out by an account of a recent butting collision, and in the absence of any defense at the hands of railroad officers we will volunteer to make one for them. The item to which we refer is as follows:

"THE OPERATOR WAS ASLEEP."

"The direct cause of the accident at South Lancaster, Mass., on the Boston & Maine, Sept. 21, was William R. Thurston, the night operator at Ayer, who was asleep at his post. One direct cause was that Conductor Luther E. Wilkins did not wake up Thurston when he found him asleep. Wilkins, the conductor of the freight train, whose fireman was killed and whose engineer and brakeman were seriously injured, testified: 'I went into the Ayer telegraph office to register and found Thurston sound asleep. I registered, jumped on the train and sped toward the scene of the disaster. He said he did not wake up the operator because the train-order signal was not set. This signal showing all right, he knew of no special reason why he should disturb the slumberer. The train dispatcher testified that he called Ayer some time and could get no reply. When Thurston finally answered he explained that his instrument was not adjusted. He said

freight No. 42 had not arrived at Ayer. An order was then sent to have No. 42 and the extra freight meet at Still River. The order was received at Ayer but a very few minutes before the collision, showing that No. 42 passed through while Thurston was asleep. Thurston up to this time has not been heard from."

It will be observed here that the public has been clearly impressed with the idea that the operator's sleeping and the conductor's failure to awaken him were the direct causes of the accident. Even a "railroad" paper says that the concurrent carelessness of two men was necessary to make the accident possible. It is stated in another account of the same occurrence that an old quarrel between these two men was the reason for the conductor's neglect to awaken the operator. The general impression among thousands of people who have read this item is undoubtedly that a system under which the safety of the lives of trainmen and passengers is dependent upon the assumption that a night operator will never fall asleep from any cause, even for a minute, was directly responsible for this collision. The image in the reader's mind, if it is at all definite, is of a careless superintendent who does not arrange his train rules so but that the falling asleep of one man, which may occur without attributing to him any great lack of consciousness, can at any time cause a collision; and the employment of men known to be at enmity will, of course, be regarded as a piece of carelessness at least. It will be said that if passengers' lives must be subject to such contingencies, it will never be possible to feel safe. Such inferences from this example are quite wrong. The careful reader will observe that the whole trouble was in the failure of the operator to read his register before attempting to state what it contained; and this he did when he was wide awake, or, at least, was not asleep; and it is a fair presumption that he would be similarly careless in the daytime, or under almost any other circumstances. He told the dispatcher that train 42 had not passed, and yet, according to the evidence, his register had upon it a plain entry showing that the train had passed. The conductor had recorded the departure of his train according to rule, and his duty in that particular was done. The operator might sleep all night and yet no danger could ensue, if he only performed his duty when awake. Nothing is simpler than the combination of rules by which safety may be secured under circumstances like these, and it is much to be regretted that people are allowed to believe that the best system of running trains on single track is subject to dangers which really do not exist. Every well-managed road has at telegraph stations a train-order signal which the operator sets in such a manner that it will stop the train whether the operator be awake or not. By the system of registering in force at Ayer, the question whether a train has passed or not is not allowed to depend upon a sleepy man's memory, but is made a matter of record.

The management of this road may have been at fault for employing this operator, because his general character may have been such as to show him to be unfit for his place. Indeed, reporting a train without looking at his register is *prima facie* evidence of this; but whatever we may say about this phase of the subject, it should be clearly understood that neither the sleepiness of the operator nor the feud with the conductor was the cause of the accident. Quarrels may exist for a long time without being detected, even by a sharp superintendent; and the excuses sometimes offered by men who succumb to weariness when on duty are such that it is hard for a considerate superintendent to blame them severely. That this operator gave a false reason for his delay in responding to the dispatcher goes to show that he was unfit for his place, and emphasizes the necessity of looking for moral character when engaging men for these places. Operators of high conscientiousness used to be somewhat plenty at moderate wages, but it is not certain that they will continue plenty at low wages. Again, this case shows the importance of keeping train order signals normally at danger, to be lowered after approaching enginemen come in sight of them, and of having freight conductors register as often as possible when running at night. The temptation to lie to save his situation doubtless appeals as strongly to the operator at a non-registering office as to the one at Ayer. But whatever this collision teaches, it does not teach that falling asleep is the dangerous thing some suppose it to be.

The new "Southwestern, Limited," of the New York Central, affords a good illustration of the constant advance in the accommodations afforded the public by the railroads, and of the fact that competition in quality of service is as active as competition in rates. This train, running at high speed and furnished with nearly all the conveniences found in the most luxurious trains, has a common passenger car, for seats in which no extra fare is charged. The trains leaving New York in the evening for both Chicago and St. Louis have

indeed, been substantially of this character for many months, and differ from the new train principally in the slightly slower time made; but the latter now goes a step farther, and differs from the Chicago 25-hour train chiefly in being more liberal to its patrons. The time is only a little slower than that of the latter. But in thus giving the public better service for the same money the idea of a "limited" train is allowed to suffer. Wherein is the limit when you take passengers on precisely the same terms as on other trains? The number of cars has to be limited in order to keep up the speed; but this feature may prove an inconvenience to passengers rather than otherwise, for it must sometimes result in crowding, and probably always makes the choice of seats very unsatisfactory for late comers. On an ordinary train the inconvenience of sitting with "the fat passenger," and holding your satchel on one knee and your overcoat on the other, is ameliorated by the very good chance that some of the passengers will get out at one of the first stops, thus giving the through traveler an opportunity to better his surroundings; but with stops only once in 100 or 150 miles the annoyance is too prolonged for patient endurance. The true limited train is one for whose limit of capacity the passenger is given a chance to prepare himself. On the New York and Chicago limited, of either the Central or the Pennsylvania, the seats are all reserved, and people well understand that to secure passage they must purchase their tickets beforehand; while in the case of the limited train with ordinary cars a person reaching the ticket office ten minutes before train time may meet the cheering spectacle of a line of twenty-five earlier customers waiting at the ticket window. He is thus shut up to the poorest seat in the train, and the fine-sounding word "limited" seems applicable chiefly to the amount of room available for his feet and his hand baggage. The new train arrives at Cleveland only a few minutes ahead of the Chicago limited, and passengers leaving New York at 9:50 can overtake the Southwestern train there. In fact, the Boston sleeping car for Cincinnati apparently goes on the old train from Albany to Cleveland. The change is, therefore, about the same as dividing the Chicago train into two sections. Uncle Sam apparently bears a portion of the increased expense, two mail cars being run from New York to Chicago, leaving at 8:50 and arriving at 9:50, 26 hours. On the "Big Four" the acceleration to Cincinnati, 2 hours and 20 minutes, is considerable, but the train arrives in St. Louis only 70 minutes earlier than heretofore, leaving Cleveland about the same time. The speed to St. Louis is about 30 miles, and to Cincinnati about 33 miles an hour, including stops. Even the Boston & Albany, which has put on a complete new train both ways for the whole of its 200 miles, and which has a splendid double track, makes only 33 miles an hour; and at this moderate rate the train is so hurried that it makes but three stops.

Watertown, N. Y., has lately furnished the somewhat rare spectacle of a jury which decided a case in favor of a railroad company where it had a first-class chance to follow the usual fashion of juries and decide the other way, on the plausible ground that there was a strong doubt, and that the other party, being poor, should have the benefit of it. About a year ago the Rome, Watertown & Ogdensburg, on the evidence of Pinkerton's detectives, who had been placed on trains for the purpose of checking the conductors' collections, discharged 11 conductors for withholding cash fares collected. The salaries of the discharged men for the preceding month were withheld, and a number of them brought actions against the company to recover the money thus kept back. The defense of the company was based on testimony giving the specific amounts which the reports indicated as having been misappropriated, and further claimed that, in the absence of a written contract, the fact that the conductors accepted employment created an implied contract to fulfill, among other duties, that of accounting to the company for all moneys collected for it; and that misappropriation of such money constituted a breach of contract warranting the company in withholding wages. In two of these cases the juries found for the conductors, but in the third, that of Middleton, tried in the Supreme Court last month, the verdict was for the railroad company. Almost in the nature of the case suits of this kind are decided against the railroad company, for the reason above alluded to, and the evidence in this case therefore must have been more than ordinarily strong, or the jury men more than ordinarily discriminating. It is a sad fact that discharges of conductors by the half-dozen or more at a time are quite frequent, and for various reasons, which we have heretofore enlarged upon, the substantial justice of the summary action taken by the company must be conceded much oftener than is agreeable to one who wishes to feel a confidence in the honor of his fellow-men. It would be much pleasanter to believe that a superintendent had made a mistake and become overzealous than to believe that the temptations incident to an American conductorship are so generally yielded to; but the facts are overwhelming. It is peculiarly true of a suit of this kind that the first court generally furnishes the true and final verdict. The law points are plain, and the decision hinges on the credence given by the jury men to the evidence on the one side and on the other, respectively, so that an appeal has little chance of changing the fortunes of the loser.

The Gulf, Colorado & Santa Fe has just adopted a uniform suit for its train and station men. From the description published, it is not greatly different from those of most other roads, except that the clothes are to be embellished with "yellow trimmings." Speaking on this general subject, a

military officer recently remarked that if he were to make choice of a suitable uniform coat and trousers he would select a color like the butternut worn in the latter part of the last war by the Southern soldiers. The great merit of this color for a soldier is that it makes him inconspicuous both in the line and when he is on picket duty or reconnoitering individually. It is what the oculists call a "confusion color," and our friend's choice of it for a passenger brakeman is based upon the supposed necessity of confusing the eye of the observer when it is inclined to detect the grease spots, ragged holes and other disfigurements which are sometimes observable in brakemen's apparel. The obvious criticism of this choice is that the object of a brakeman's uniform is not to conceal his slovenly habits. He is put in uniform for the moral effect on the man himself and to make it easy for passengers to pick him out in a crowd. For these purposes blue is a sort of happy medium between the conspicuous red of the British soldier and the dirt-colored habiliments of the Confederate. On the whole, however, we are inclined to agree with the view that for many of the men on some roads the butternut suit would be just the thing. Where passenger trainmen, from poverty or from their own or their superiors' carelessness, wear their clothes until they are hardly decent enough for a swineherd, and where the exigencies of railroad economy demand that a brakeman shall spend part of his time in crawling around and under freight cars and another part as a "gentleman porter" in a ladies' car, without a sufficient interval for changing his clothes, the more confusion that can be imparted to the eye of the passenger by skillful adaptation of the color of the clothes, the better.

It is stated that the New York, New Haven & Hartford has decided to abolish its dining-car service because of the danger from the cook stove. The New York Times, in reporting the fact, says: "But for its total irrelevance, the fact might be added that dining cars are run at a loss." If the real motive is economy, the move is a bad one, or would be for any road having competition. As, however, President Clark has expressed a determination to give the public the best service possible, we presume the directors act the same as they would if the threatened "Parallel" road were not away off in the dim future. In the case of the Boston trains that run over the New York & New England, the dining cars are furnished by the latter road and kept wholly on its own lines, we believe; but on the Springfield route the cars run over both roads and the Boston & Albany furnishes half of them, so that the withdrawal will affect the latter. The popularity of the dining car is now so firmly established that any diminution of a service once established must be regarded as questionable economy, unless the loss be decided and constant. A direct loss, simply, may be greatly overbalanced by the influence on patronage. And the question of safety from fire is perhaps not so unsolvable as it appears. Cooking by steam from the locomotive is practicable, and one of the heating companies has a plan for carrying out the idea. The reporter states that the decision is a consequence of the derailment near New Haven, June 29, and adds that President Clark is of the opinion that the safest method of heating cars is by hot water, not by steam from the locomotives. How the water is to be heated is a question that seems to have escaped attention.

Russian grain exports, which for several years had been less important than previously, last year increased immensely. For three years the exports of grain of all kinds have been in tons of 2,000 lbs.:

	1886.	1887.	1888.
	4,307,472	6,172,882	8,631,036
Thus last year they were 40 per cent. greater than in 1887, and twice as great as in 1886. The chief direct competition of Russia with this country is in wheat, but this formed but about three-eighths of its total grain exports last year, and its large rye exports have much to do with determining the demand for wheat in adjacent European countries. Reduced to bushels, its exports of the chief grains have been:			
	1886.	1887.	1888.
Wheat.....	47,681,000	71,170,200	110,336,200
Rye.....	39,965,333	48,473,333	66,334,000
Barley.....	24,894,000	36,264,750	48,932,500
Oats.....	38,003,750	67,124,250	97,654,500
Corn.....	12,260,000	17,945,000	10,180,000
Total.....	162,724,083	240,077,533	333,477,200

Besides this, there were exports of other unspecified grains which last year amounted to 506,952 tons, equivalent in weight to 16,898,400 bushels of wheat.

The wheat exports were more than two and one-half times the greatest exports from India, which have been charged with breaking down prices, and the increase in the Russian wheat exports since 1886 is one-half more than the total Indian exports have ever been.

Nearly 23 per cent. of the grain exports last year were shipped from Odessa, and 30 per cent. from other Black Sea ports, while 25 per cent. went by Baltic ports—St. Petersburg, Libau and Riga.

The Mahoning Division of the New York, Pennsylvania & Ohio is following the example of the Jeffersonville, Madison & Indianapolis in placing its train dispatchers temporarily on freight trains for the purpose of making them better acquainted with the road over which they are to direct the movement of trains. Each dispatcher will spend four weeks on a train, half of the time on local and half on through freight. He will not take sole charge, but will simply act conjointly with the regular conductor. A train dispatcher, writing to the *Railway Service Gazette*, has criticised this plan of education, giving utterance to various strictures on

the wisdom of the Superintendent of the J., M. & L., and of the *Railroad Gazette* in commending his work; but, so far as we can see, the objection is to the method and not to the substance. No fault is found with the principle of making dispatchers fully acquainted with the road of which they are put in charge, and, indeed, the correspondent himself mentions plans of his own for doing the same thing in a way which he doubtless regards as better than that adopted in Indiana. Apparently this writer would agree to the N. Y., P. & O. plan, but would not deem it proper to give the dispatcher full authority on a train. Of course, it is imaginable that a dispatcher might be too little acquainted with railroad work to be placed in charge of a train of any sort, but it is to be presumed that no superintendent would entrust a train to a person not fairly competent to master questions coming up in its management.

The passenger department of the Pennsylvania has issued a neat pamphlet giving the itinerary of the International American Congress excursion noticed in these columns last week. The book is accompanied by a map of the United States, showing in red the route of the excursion. The roads over which the train runs are the Pennsylvania; West Shore; Old Colony; New York & New England; Boston & Maine; Concord & Montreal; Portland & Rochester; Boston & Maine; New York & New England; South Manchester; Central New England & Western; New York, New Haven & Hartford; Connecticut River; Boston & Albany; New York Central & Hudson River; Lake Shore & Michigan Southern; Cleveland & Pittsburgh; Lake Shore & Michigan Southern; Michigan Central; Grand Rapids & Indiana; Illinois Central; Chicago, Milwaukee & St. Paul; Chicago, St. Paul, Minneapolis & Omaha; Union Pacific; Chicago, Rock Island & Pacific; St. Louis, Keokuk & Northwestern; Chicago & Alton; Wabash; Indianapolis, Decatur & Western; Jeffersonville, Madison & Indianapolis; Louisville & Nashville; Pennsylvania Co., Pennsylvania Railroad.

If the United States government is ever going to try state ownership of railroads, now is its opportunity. The iron should be struck before its incandescence peters out, as it were. A Chicago reporter figures out that for the manipulations of grain rates recently discovered there (and reported in our traffic column) the railroads are liable to penalties of \$125,000,000 in money and 50,000 years imprisonment; and the innocent romanticist seems to think the magnitude of the penalty makes it unenforceable. But nothing could be easier, and the government's duty is plain. The 50,000 years can be divided up among 5,000 stockholders and officers, giving them 10 years apiece, and the stock can be confiscated in liquidation of the fines. Then the politicians can run the roads to suit themselves, and they will have 10 years the start of their most troublesome critics, provided the jails hold out.

The train telegraph, for conveying messages to and from moving trains, seems not to have made much progress of late; but the Pennsylvania has put in use a scheme which is next door to it, in arranging for the publication of quotations from the New York and Philadelphia stock exchanges in the cars of the New York and Chicago limited. Reports are delivered to the trains at Philadelphia, Harrisburg and Altoona. If a man is to "operate" in stocks as he travels he must have reports oftener than once in two or three hours, and we cannot but think that the only consistent policy for the road is to "go the whole figure" and establish a complete system of train telegraphy. There should be a continuous wire from New York to Pittsburgh, with a "ticker" in each car giving quotations every two minutes.

The Michigan passenger rate law went into effect Oct. 1. The provisions of this law were fully explained in our issue of Aug. 2. Certain roads are allowed to charge but two cents per mile, others two and a half cents, and others three cents. It is also provided that 1,000-mile tickets, good for two years from date of purchase for a man and his family, must be kept on sale by the roads on the Lower Peninsula for \$20, and by the roads on the Upper Peninsula for \$25, the company being obliged to redeem the unused portion of such tickets at three cents per mile before the expiration of such ticket, if so desired by the purchaser.

NEW PUBLICATIONS.

Transactions of the American Institute of Electrical Engineers, August and September, 1889.

The articles contained in this number are: Magnetism in its Relation to Induced Electromotive Force and Current, by Prof. Elihu Thomson; On the Relation Between the Initial and the Average Efficiency of Incandescent Lamps, by W. H. Pierce; The Efficiency of the Arc Lamp, by H. Nakano; The Spiral Coil Voltmeter, by Harris J. Ryan; Personal Error in Photometry, by Prof. Edward L. Nichols; On Modern Views with Respect to Electric Currents, by Prof. Henry A. Rowland. This publication contains each month an index to current electrical literature, which must be of considerable value to those who have occasion to investigate this branch of science.

The Journal of the Iron and Steel Institute, No. 1, 1889. London, E. & F. N. Spon. 8vo, pp. xiv., 454.

This volume contains an account of the proceedings at the annual meeting of the Institute, May, 1889, together with an Appendix, consisting of obituary notices and numerous articles relating to the iron and steel industry. The most important papers read at this meeting have already been

published, either wholly or in part, in different technical journals; but the discussions, which frequently constitute the most interesting and useful portion of the proceedings, are given here in print for the first time. Among the statistics in the Appendix, those relating to the United States occupy a prominent and extended space. The following brief summary of the cost per ton of making Bessemer billets from pig iron in the United States (locality not stated) may interest the reader:

Converting pig iron into Bessemer ingots.....	\$5.41
" Bessemer ingots into Bessemer blooms.....	2.08
" blooms into Bessemer billets.....	4.34
Total.....	\$11.83
This amount is divided as follows:	
Material.....	\$4.50
Labor.....	3.35
Fuel.....	.89
Plant, maintenance and working expenses.....	3.09
Total.....	\$11.83

Journal of the Franklin Institute, October, 1889.

The principle articles in this number are: Cotton Fibre, by Thomas Pray, Jr.; The Army of Kukuanaaland, by Major O. E. Michaelis, U. S. A.; Experiments to Determine the Relative Economic Efficiency of a Reciprocating Pump, a Rotary Pump and a Steam Syphon Pump, by Chief Engineer Isherwood, U. S. N. The following is a partial list of the lectures to be delivered before the Institute for the season of 1889-90:

- Monday, Nov. 4.—Daniel Ammen, Rear Admiral, U. S. N. "Proposed American isthmian canal routes."
 Friday, Nov. 8.—Prof. Lewis M. Haupt, University of Pennsylvania. "Municipal engineering."
 Monday, Nov. 25.—Prof. C. Herschel Koyl. "The evolution of rail-road signaling."
 Monday, Dec. 9.—Mr. T. Dunkin Paret, President of the Tanite Company. "Emery Wheels."
 Monday, Dec. 16.—Mr. Ralph W. Pope, Secretary American Institute of Electrical Engineers. "Electricity: its past, present and future."
 Friday, Dec. 20.—Mr. Thomas Pray, M. E., C. E. "What does a steam horse-power cost?"
 Monday, Jan. 27.—Dr. W. Thomson, Philadelphia, Professor Ophthalmia and Surgical Expert Pennsylvania Railroad Company. "Color blindness."
 Monday, Feb. 10.—Mr. Eugene Griffin, Thomson-Houston Electric Company. "Electric Railways."
 Friday, Feb. 21.—Mr. Wm. F. Durfee, Superintendent Pennsylvania Diamond Drill Company. "Diamond Drilling."
 Monday, Feb. 24.—Dr. Charles B. Dudley, Chemist to the Pennsylvania Railroad Company. "Bearing-metal alloys."

A Treatise on Masonry Construction. By Ira O. Baker, Professor of Civil Engineering, University of Illinois. New York, John Wiley & Son, 1889. Octavo, xv. and 552 pages, with six plates.

This volume, which is designed for the use of students in engineering and architecture, is an outgrowth of the needs of the author's own class room. It might be expected in a work having this origin that the theoretical discussions would predominate, and that the practical consideration would be imperfectly presented, and it is therefore a matter of some surprise to find that quite the contrary is the case. The latest and best engineering practice is fully and clearly detailed, strength, beauty, durability, workmanship and cost receiving each due attention, thus placing in the hands of students and practical men a mass of material which has heretofore only been accessible in the files of technical journals or the transactions of societies. The theory, however, occupies a subordinate place, and in some instances it does not appear to be presented as clearly as it ought to be for the needs of students. The work is divided into four parts, and its scope may perhaps be best explained by saying a few words regarding each.

Part I. treats of the materials—that is, of stone, brick, lime and cement—and consists of 78 pages. This presents methods of preparation and manufacture, methods of testing, tables of strength, and standard specifications.

Part II., including 104 pages, treats of the preparation and use of the materials. Here are stated methods of making mortar, concrete and artificial stone, methods of quarrying and stone cutting, and the general requirements which stone and brick masonry must fulfill. The classification of masonry adopted is that recommended by a committee of the American Society of Civil Engineers several years ago.

Part III., which embraces 128 pages, is devoted to the important subject of foundations. An entire chapter on piles and pile drivers will be found interesting, and the author gives a new formula for the supporting force of a pile. In deducing this he does not state that the entire investigation rests upon the assumption that the strain in the ram and pile due to the blow is less than the elastic limit of the material. Since this is probably exceeded in most cases, at least in the pile, the new formula will be likely to prove only a rude approximation, particularly as it neglects the resistance due to the friction of the soil. Cofferdams, cribs, caissons, pneumatic foundations, the freezing process, and dredging through wells are well explained and illustrated by many modern examples. On these and other practical points the book is brought down to date, giving in many instances valuable information in regard to cost.

Part IV. covers 217 pages and treats of masonry structures, which include dams, retaining walls, bridge abutments and piers, culverts and arches. On the subject of dams, the gravity type is alone considered, and only the trapezoidal cross section is analytically investigated, although one of the proposed profiles of the Quaker Bridge dam is illustrated and

explained. Under the head of retaining walls, a number of theories of earth pressure are presented, prominence being given to the complex and unsatisfactory formulas of Weyrauch. It is, we think, scarcely fair to the student to present these pages of theory without a single numerical example of their application, either in investigating the safety of a wall or in determining the thickness of one whose height is given. On bridge piers and abutments, however, the discussion is more satisfactory, and an investigation of the stability of one of the piers of the Cairo bridge is worked out in detail. The chapter on culverts is an excellent one, and the accompanying drawings show the standards in use on several railroads. The chapter on arches is a long one, fully 50 pages being devoted to the statement and comparison of several theories, but practical considerations relating to centres, brick arches, empirical rules and dimensions are also set forth with much detail.

This book is destined to be of much value to both students and engineers. Its great merit is in the careful and complete presentation of the essentials of modern, and particularly of American, practice as applied to masonry structures. The author has exercised discretion in selecting typical examples and in condensing his descriptions so as to set forth the salient features and governing principles. But from the theoretical side the book has defects. Theory in a technical school is more important than practice, for the student is not learning a trade, and it is essential that he should be taught how to think and to reason correctly in applying the fundamental laws of mechanics to problems in design. It is of little value to require students to study comparisons of doubtful theories, but if he gains a mastery of any reasonably correct theory so as to apply it to varied problems by actual numerical computation, and at the same time understands its limitations, he will have made a real step in advance. Notwithstanding the author's lengthy disquisition on the theories of the retaining wall, he gravely tells the student that they "are not sufficiently exact to serve even as a guide," and that "it is far more simple and direct to assume the thickness at once." To this we cannot agree, for we believe theory sufficiently exact, considering the factor of safety, which must always be introduced, to prove of most valuable assistance in deciding upon the most economical forms and dimensions of walls. On the subject of arches the author appears to have misunderstood Rankine's theory; at least his statements on page 490, if correct, and we believe them to be erroneous, point out the first grave errors that have been detected in the writings of that great master of engineering mechanics.

Express Trains, English and Foreign; a Statistical Account of all the Express Trains of the World. By E. Foxwell and T. C. Farrer.

A book of this kind may be judged in two ways; as a collection of facts, or as a contribution to railroad literature. As a collection of facts, this book deserves unusually high praise. The figures on express mileage in different countries are new, important, and on the whole extremely accurate. They are interesting for their own sake, they are still more interesting for the light they throw on comparative standards of efficiency in railroad service. Some such collection as this should have been made long ago; but the labor involved in doing it well has been so great as to frighten most investigators away. Now that the work has been done, and well done, we have all the more reason to be grateful.

The standard of express service is taken by the authors at 40 miles an hour, including stops. With this rate as a minimum, the daily express mileage of Great Britain in August, 1888, was 62,904; of the United States, 13,956; of other countries, a mere trifle. In order to give any show at all to these latter, the standard for them has to be reduced to 29 miles an hour. On this absurdly low basis France has an express mileage of 41,130; Holland, 8,000; Belgium, 6,919; North Germany, 25,795; South Germany, 9,085; Austria, 13,832; Russia, 3,060; Switzerland, 2,255; Italy, 4,705.

Of the individual English roads, the Great Northern shows the best performance. The Northwestern and the Midland both show a larger aggregate express mileage, but their track mileage is much larger and their speed, on the whole, not so great. The Great Northern system includes 977 miles of line. Express trains are run over 290 miles of this system. The daily express mileage is 9,544, an average of 33 fast express trains passing any given point each day. The average speed of these trains, including stops, is not quite 44 miles; excluding stops, 47 miles. In other words, the Great Northern line runs one-fourth more fast trains than that part of the Pennsylvania main line between Philadelphia and Jersey City, and gives two miles an hour better average speed.

A large part of this mileage has been developed in the last twenty years. As late as 1871 it was thought unwise to adopt so exacting a standard as 40 miles an hour. Comparative figures are as follows:

Year.	Express mileage.	Average speed.
1871.....	23,700	37.6
1883.....	42,600	41.6
1888.....	62,900	41.4

The development of high speeds in the United States is still more recent, and there is a noticeable difference in this respect between 1889 and 1888. But the general results and proportions of last year still hold good. Of the express mileage of the United States on the 40-mile standard, more than one-quarter was between Jersey City and Philadelphia, the Pennsylvania contributing 2,334 miles and the Bound Brook route 1,248. The daily express mileage credited to the whole Pennsylvania system is 6,171.

It was such a Herculean task to look over the time-tables of the whole American railroad system that some mistakes

and omissions were inevitable. It is a great credit to have avoided serious ones. We have looked over the "Travelers' Official Guide" for August, 1888, from which these figures were taken, and find occasion for a number of slight criticisms, but no severe ones. Of New England roads, the Providence & Worcester should appear in the list; the mileage credited to the Old Colony and to the New York, Providence & Boston should be a little increased, though in the latter case the error is the fault of the published timetable rather than of the author's. In the Middle States the Lehigh Valley deserves much more credit than it gets; especially in the neighborhood of Tunkhannock Junction, where one train in 1888 was scheduled to run 45 miles in 64 minutes with two intermediate stops (in 1889 there is another train which does even better), and at least two others come just within the book's standard. The Philadelphia & Reading and the C., C. & I. both get scant justice; while the West Shore has hard luck with a large number of trains running a very small fraction below 40 miles an hour, and therefore properly omitted. But if this road (and for that matter the Lake Shore or the Chicago & Atlantic) had received the same liberal treatment in the neglect of fractions which is accorded to the Union Pacific, the Cincinnati, Hamilton & Dayton, or the Vandalia line, their express mileage would have been vastly increased. The aggregate on the Michigan Central is too small, and the details not quite correct as far as they go. The Louisville & Nashville shows one mistake of inclusive and one of exclusive. The South Carolina Railroad has a little more fast mileage than is here reported; so has the Chicago & Alton; while the Wabash, the Wabash Western, and the Ohio & Mississippi all had trains which technically came within the limit, and deserved to be included quite as much as some of those contained in the list. But these are mere trifles. The general result is first-rate; the aggregate of all corrections would amount to comparatively little.

As a contribution to railroad literature, the book is of varying merit. Mr. Farrer's work is much better than Mr. Foxwell's, the former being excellent, the latter indifferent. Much of what Mr. Foxwell gives is a reprint of articles from the *Pull Mall Gazette*—writing which did very well in a newspaper, but which should have been much revised and digested before putting it into permanent shape. Mr. Farrer, on the other hand, habitually writes well, and sometimes extremely well. His explanations of the policy adopted by different European lines, showing the relations between politics and railroad management, are almost always interesting. He never enjoys himself better than when he is engaged in showing up "the sort of effiteness," as he expresses it, "that state management always produces after a time." His subject furnishes him an unending series of texts for such comment.

French Engineers on American Bridges.

The Société des Ingénieurs Civils recently discussed this question, and an account of the discussion, published in the *Revue Industrielle*, may be of interest, as showing what foreign engineers think of American methods:

The new systems of construction employed in America for metallic bridges are well known. One of the most noticeable bridges is that at Poughkeepsie on the Hudson, which was opened last year. Rivets are very sparingly used, large pins being substituted, thus rendering the erection of the trusses more economical and rapid. The metallic portion of the large bridge at Poughkeepsie was erected in a few months. Mr. F. de Gazay mentions, in a communication which he has just made to the Société des Ingénieurs Civils, a still more extraordinary example, the large bridge at the base of Niagara Falls is 200 ft. above the river, with central spans, 480 ft. long, of the same system as those used in the bridge over the Hudson. The shop work and erection of the Niagara Bridge were completed in the short space of nine months and a half. The dimensions of the Poughkeepsie Bridge are given, followed by the statement that this work was erected very rapidly and economically, notwithstanding its magnitude. Four of the spans are rigid trusses, which were erected upon false work resting on enormous piles driven into the bed of the river near its centre. The three remaining spans were erected without scaffolding or other false work, according to the new system called by the Americans "cantilever."

To illustrate the great economy and safety resulting from the simplicity of the American system, the author recalls the facts which occurred a few years ago on the Oroquieta Railroad, which crosses the Cordilleras at an altitude of more than 12,000 ft. At the Verrugas Viaduct, three short spans on the Fink system, 100 ft. long, were erected in 16 hours by a force of 50 men at a height of 275 ft. above the ground. On the same railroad four spans each 100 ft. in length were erected. Two were built by the English, with the old American iron truss. The erection required more than two months. When tested, the first one fell into the ravine. The second also broke down, when loaded, and fell upon the scaffolding, which had been left in place. The third bridge, of French construction, and whose lattice trusses were riveted, was erected in about a month, and sustained the test perfectly. The fourth, of American construction, on the Fink system, also sustained the test without injury. It had been erected in five days. An interesting fact to be noted is that the three European bridges each weighed 164 tons, while the American bridge only weighed 68 tons. These four bridges were of iron, and their prices must necessarily have been in proportion to their weights, apart from certain differences in the methods of construction.

After the reading of this communication Mr. S. Périsse expressed the opinion that, when the question of time is a condition *sine qua non*, it is well to use American pinned bridges, but that, in all other cases, the preference should be given to riveted bridges. Even though pinned bridges sustain tests just as well as riveted bridges, there is reason to believe that the latter will be made durable, since the play which necessarily occurs between the pins and the holes is a sure cause of destruction which does not exist in riveted bridges.

On the other hand, to compare the economy of one system with that of the other, account should be taken, not only of the weight, but also of the cost of construction per unit of weight which, according to Mr. Périsse, must be much higher for pinned than for riveted bridges—but it is none the less true that the Americans know how to build fast and well.

Mr. Régnaud remarked that people often make mistakes

in talking about the pins of American bridges. They are not, properly speaking, bolts for tightening joints, but, more accurately, large joint-pins of great diameter, turned and fitted to within 1/1000 in. to the holes in the parts which are to be united. As to the question of price, Mr. Régnard thinks that the American system ought to be very cheap on account of its lightness, and also because it is composed of parts which require little or no forge work.

TECHNICAL.

Locomotive Building.

The Denver, Fort Worth & Texas has ordered from the Baldwin Locomotive Works 10 consolidation engines, with 20 x 24 in. cylinders.

The charter of the Richmond Locomotive and Machine Works has been amended, so as to allow the company to increase its capital stock to \$2,500,000.

The Louisville, St. Louis & Texas has placed an order with the Pittsburgh Locomotive Works for two consolidation engines.

The Toledo, St. Louis & Kansas City road last week placed an order for building 15 new locomotives.

The Fort Worth & Rio Grande has recently put in service two new freight locomotives from the Rhode Island Locomotive Works.

The Illinois Central shops, at McComb, Miss., are building two switching engines, one to be used at New Orleans and the other at Clinton, Ia.

The first engine built at the Omaha shops of the Union Pacific since Mr. G. W. Cushing became Superintendent of Motive Power was finished last week. Three more are now being built at the shops, and will be completed within two months.

The New York, Lake Erie & Western has placed an order with the Baldwin Locomotive Works for three 10-wheel passenger engines, with 20 x 24 in. cylinders and 68 in. drivers.

Car Notes.

The Union Pacific will soon let the contract for building a number of new freight cars, in addition to the order for 300 recently awarded.

An order for 500 gondola cars of 25 tons capacity is said to have been placed by the Beech Creek road.

The Delaware & Hudson Canal Co. has let contracts to the Jackson & Woodin Mfg. Co., of Berwick, Pa., for building 250 cars.

The Wheeling & Lake Erie has awarded the Terre Haute Car & Mfg. Co. the contract for building 250 coal cars, and the Peninsular Car Co., of Detroit, has received an order for a similar number.

An order for fifty 35 ft. coal cars has just been completed at the shops of the Illinois Central at McComb, Miss. Work will soon commence at these shops on 25 stock cars, 35 ft. long.

The Barney & Smith Mfg. Co., of Dayton, O., has just completed two handsome dining cars for the Cleveland, Cincinnati, Chicago & St. Louis.

The Pullman Palace Car Co. is so crowded with business that it has been compelled during the past month to decline contracts for 2,000 cars.

The Ohio Valley road will soon commence building four freight cars and two cabooses at its shops at DeKoven, Ky.

The Terre Haute Car & Mfg. Co. has contracts to build 500 coal cars for the Chicago & Northwestern.

The Toledo, Columbus & Hocking Valley has recently let contracts for building 750 cars, and the Kansas City, Ft. Scott & Memphis is also said to have 500 cars under contract on a recent order.

The Pennsylvania Co. has given an order for 200 stock cars to the Missouri Car & Foundry Co. These cars will be equipped with the standard brake rigging lately adopted by the M. C. B. Association and Janney couplers.

Bridge Notes.

The board of engineers appointed by the Secretary of War to examine the site for the proposed bridge over the Ohio River, at Louisville, has submitted a report condemning the site selected.

The city engineer of Nashville, Tenn., has completed plans and estimates for a proposed iron bridge over the road on Demonvren street. The bridge, if built, will be 150 ft. long, and will cost about \$60,000.

H. W. Adams, of Manson, Va., is asking proposals for constructing an iron bridge over the Otter River in that town.

The contract for building the bridge across the Chacon Creek, at Laredo, Tex., has been awarded to the Kansas City Bridge Co., of Kansas City, Mo., at \$11,900.

S. H. Hudnall, of Brookneal, Va., will receive proposals until Nov. 9 for the construction of a wooden or an iron bridge across Falling River at Hobson's Mill. The bridge will have a span of 149 ft.

But one bid, that of the Wrought Iron Bridge Co., of Canton, O., amounting to \$700, was received by the county surveyor for constructing a 31-ft. span iron bridge near Kansas City, Mo.

The government superintendent of the Rideau Canal is preparing plans for the construction of a swing bridge across Rideau Canal between Ottawa and Archville. The bridge will be for carriages and foot passengers. The work will cost about \$8,000.

The Homestead Bridge Co. has been chartered in Pennsylvania with a capital stock of \$30,000, to build a bridge over the Monongahela River, near Nine Mile Run.

The North Side Bridge Co. has been organized in McKeesport, Pa., to build a bridge across the Monongahela River at the foot of Market street, in that city.

The Committee on Bridges of the Minneapolis City Council has recommended that bids be asked for removing the suspension part of the present bridge, and completing another section of the steel arch. The city engineer estimates that the work can be done for about \$80,000.

It is reported that bridges are to be built at the following places: Over the White River, at Hindostan Falls, Ind., by the county commissioners; over Vermilion street, in Danville, Ill.; over Trinity River, at Aurora, Tex.; over the tracks of the Fitchburg, in Worcester; also at Westerly, R. I.; Whitehall, Ill.; Benton Harbor, Mich.; and Vermilion, Dak.

Manufacturing and Business.

The Hercules Spike Co., of Chicago, has been chartered in Illinois, with a capital stock of \$300,000, to manufacture railroad spikes. Henry L. Norton and James White are among the incorporators.

The Eastern Railroad Association has passed upon the patents of the Kelsey drawbridge signal, and approved them. This signal was illustrated in the *Railroad Gazette* of June

15, 1888, and has been in use on the New York, New Haven & Hartford, at Middletown, Conn., over a year. The Kelsey Signal Co., of New Haven, Conn., controls the patents.

We published last week a list of awards made to American exhibitors at the Paris Exposition. Among these appears the name of J. A. Fay & Co., of Cincinnati, which firm was awarded the grand prize for wood-working machinery. The exhibit made by this firm seems to have attracted particular attention, and it has been made the subject of numerous illustrations and description in English and Continental journals. It appears to have been quite a revelation to the Europeans of the development of American wood-working machinery.

The Walker Mfg. Co., of Cleveland, O., has been awarded the contract for cable winding machinery for a plant to be built in Portland, Or., by the Pacific Cable Construction Co., of San Francisco. The plant will be driven by cotton ropes instead of gearing. This plant is in addition to the one recently contracted for in Seattle.

Detrick & Harvey, Baltimore, Md., manufacturers of open side planers, report the following recent shipments and orders for these tools: Midvale Steel Co., Nicetown, Philadelphia; Thomson Electric Welding Co., Lynn, Mass.; Lowell Machine Shop, Lowell, Mass.; Weed Sewing Machine Co., Hartford, Conn.; the Harlan & Hollingsworth Co., Wilmington, Del.; Chas. Hillman & Co., Philadelphia, Pa.; and the United States Navy Yards, New York, Norfolk and Mare Island.

The works of the Westinghouse Electric Mfg. Co., at Pittsburgh, were considerably damaged by fire recently. The fire will not interfere in any way with the operations of the plant. It is stated that the works may be removed to Wilmerding, Pa., 14 miles east of Pittsburgh. The air-brake works at this place are nearly completed, and the plant of the Fuel Gas & Electric Engineering Co. is to be soon removed also. Plans have been prepared for building a glass-house to make incandescent light globes.

Reihle Brothers, proprietors of the Philadelphia Scale and Testing Machine Works, report the following recent orders among others: one 100,000-lb. screw-power testing machine, to Andrews Bros.; one 50-ton railroad track scale, Elmira Gas Light Co., Elmira, N. Y.; one 80-ton railroad track scale, Bement, Miles & Co., Phila., Pa.; one charging scale, West Superior Iron & Steel Co., West Superior, Wis.; one 10-ton scale, Wilkesbarre Coal Co., New York; four 4,000-lb. rolling mill scales, Oxford Iron & Nail Co., Oxford, N. J.; one 6,000-lb. pig metal scale, Benjamin Atha & Co., Newark, N. J.; one 4,000-lb. rolling mill scale, Holyoke Machine Co., Holyoke, Mass.; two 30-ton Robie screw jacks, to Wm. Cramp & Sons. In addition to the above, large orders have been received for special iron trucks for blast furnace and rolling mill service, and also for railroad and warehouse trucks. A variety of the machines made by Reihle Brothers can be seen at the Pittsburgh Exposition.

Iron and Steel.

The Crescent Steel Co., of Pittsburgh, with a capital stock of \$1,000,000, was chartered recently. The directors are Reuben Miller, William Metcalf and Charles Parkin. The firm was formerly known as Miller, Metcalf & Parkin, or the Crescent Steel Co., Limited. The limited partnership has been dissolved and the company incorporated to continue the manufacturing business of the old firm.

The Findlay Iron & Steel Co. and the Briggs Edge Tool & Rolling Mills Works, of Findlay, Ohio, have merged into the Findlay Rolling Mill Co., incorporated with a capital stock of \$100,000.

Furnace F. of Carnegie Bros. & Co., Limited, at Brad-dock, Pa., which has been idle for some time undergoing repairs, has resumed operations. All the stacks of this firm, including the two Lucys, at Pittsburgh, are now in successful blast.

Col. J. H. Sands and others have incorporated the Roanoke Iron Co., to build an iron furnace. The capital stock is to be \$150,000. Mr. Sands is President; Henry King, of Allegheny, Pa., Manager, and James W. Tyler, Washington, D. C., Secretary and Treasurer.

The Carpenter Steel Co. has completed works at Reading, Pa., with J. H. Carpenter as General Manager, to manufacture hammered and rolled crucible steels for tools, files, springs, etc.

The Wisconsin Malleable Iron Co. is making extensive additions to its plant at Milwaukee, Wis. A new foundry is being erected which will be 67 ft. wide by 297 ft. long. The capacity of the works will be almost doubled by these enlargements.

North Penn Furnace, at Bingen, Pa., owned by the Bethlehem Iron Co., of Bethlehem, Pa., which has been idle for some time, is now undergoing repairs, and will be put in blast at an early date.

Hubbard Furnace No. 2, of Andrews & Hitchcock, at Hubbard, O., which has been idle for some time, was recently put in blast. The firm will operate both stacks for the present.

The Cambridge Iron & Steel Co., of Cambridge, O., has filed a charter at Columbus, with a capital stock placed at \$100,000.

The stockholders of the Pennsylvania Steel Co. have elected the following directors: Luther S. Bent, Edmund Smith, H. H. Houston, William M. Spachman, George Small, Eben F. Barker and Charlemagne Tower, Jr.

The Illinois Steel Co. is reported to be preparing plans for extensive additions to the South Chicago plant. A plate mill of modern type is one of the projected improvements, to be equipped with open-hearth furnaces. The blast furnaces may also be increased in number. At Joliet the company is erecting a new office building, and also a building with library, reading room, club rooms, etc., for the employees.

The Southern Iron Co. has been organized at Huntsville, Ala., with a capital stock of \$2,700,000. The following directors have been chosen: N. Baxter, Jr., T. Seddon, Birmingham; H. S. Chamberlain, Chattanooga; John P. Williams, James C. Warner, I. T. Rhea, Percy Warner, T. W. Wrenne, all of Nashville; T. C. Hillman, of Birmingham; G. M. Fogg, of Nashville; A. M. Shook, C. M. McGhee, of the Roan Iron Co., and John H. Iman, of New York. The officers have not been elected, but Mr. Baxter will be President and Mr. Shook General Manager. The general office will be at Nashville, Tenn. The company has closed the purchase of three charcoal furnaces in Middle Tennessee, one charcoal furnace at Attalla, Ala., and the Roan Iron Co.'s steel rail mill, in Chattanooga. The purpose of the company is the immediate remodeling of the mill at Chattanooga to make steel by the basic process, using Siemens-Martin furnaces. The product of all the furnaces will be taken to that city to be manufactured into steel rails, nail plate, steel wire and plates of all kinds.

The London & Northwestern at the Paris Exposition.

The London & Northwestern Railway, of England, has been awarded the "Grand Prix" at the Paris Exhibition for its saloon carriage exhibit.

A Rack Railroad.

The plans for a new rack railroad have just been completed in Switzerland. It will be known as the Mount Säntis Railroad, and will establish a connection with the summit of Mount Säntis, over 8,000 ft. above the level of the sea. Its probable cost is placed, in round numbers, at \$440,000.

Car Heating in New York.

The State Commissioners have granted the Central New England & Western Railroad Co. an extension of the time in which they are required to equip their passenger cars with steam heating until Nov. 1. The same extension has been made in the case of the Pullman Palace Car Co., on the representation that it has but 18 cars running in the state which are not yet so equipped.

The Merchants' Bridge, St. Louis.

A contract was let Sept. 2 to the Union Bridge Co. for 1,600,000 lbs. of steel for the superstructure for approaches to the Merchants' bridge. It is required that they shall be erected by February, 1890. This will carry the superstructure across two streets on the Missouri side and over the Chicago & Alton, Indianapolis & St. Louis and Wabash railroads on the east side. The last caisson of the bridge at Bissel's Point is nearly completed.

Bids for Breakwater.

The Canadian Government is calling for tenders for the construction of a breakwater at Wiarton Harbor, Ontario, for which Parliament last session voted \$10,000. Tenders will be received by the Minister of Public Works, Ottawa, up to the 22d October, where plans and specifications may be seen, as also by application to Mr. Dismore, Postmaster, Wiarton, Bruce County, Ontario.

Car Heating in Switzerland.

The Swiss government has issued notices to the various railroad companies directing attention to the law regarding the heating of railroad cars. While steam heating is not specified, it is pointed out that such a system would meet the prescribed requirements, and it is accordingly recommended that the necessary arrangements for the use of such a system be made. A period of five years from the date of the notice is allowed for carrying out the change.

Shop Note from Denver.

The shops of the Denver, Ft. Worth & Texas are situated about a mile from the city of Denver. They consist of a round-house, machine shop and blacksmith shop—all built of stone. At present they are being somewhat enlarged, and when completed the main shop will be 60 x 120 ft. The blacksmith shop is 40 x 80 ft. About 200 men are employed. The shops are heated by steam. An order for about \$25,000 worth of machinery for the machine shops has been placed with Messrs. William Sellers & Co., of Philadelphia, consisting of lathes, steam hammers, wheel-grinding machines, slotters, etc.

Rails in the St. Gothard Tunnel.

Experience on the St. Gothard Railroad has shown that the standard rail there used, which weighs about 75 lbs. per yard, and has a total height of a little over five inches, lasts scarcely one-third as long in long tunnels with comparatively poor ventilation as it does on open sections. The company accordingly has concluded to adopt for service in such tunnels a higher and heavier rail. The proposed new section is about 5.68 in. high, has a width of head of 2.48 in., and provides for a weight of about 88.5 lbs. per yard. An appreciable saving in cost of maintenance of way is looked for from this change.

The Minnesota Iron Car Co.

The transfer of the property of the Minnesota Car Co. to the Minnesota Iron Car Co., of Duluth, took place Oct. 6. George W. Ettinger is treasurer and R. L. Ettinger General Manager of the new company. The capital stock is \$2,000,000; paid in, \$1,000,000. The car works are the most extensive in the Northwest.

The introduction of the tubular iron car which this company will make has been more rapid than is generally known. The Iron Car Co. has now contracts for 3,400 cars and orders entered for 7,625. The number already built is 4,950.

The Pneumatic Train Signal.

The Delaware & Hudson Canal Co. has adopted the Westinghouse train air signal and is now applying it to passenger cars and engines. The company has also adopted the Westinghouse quick-action brake to supplant the old automatic. The following is a list of the roads in the United States now using or applying the train air signal: Atlantic Coast Line; Baltimore & Ohio; Cincinnati, New Orleans & Texas Pacific; Cleveland, Akron & Columbus; Cincinnati, Indianapolis, St. Louis & Chicago; Chesapeake & Ohio; Chicago, Burlington & Quincy; East Louisiana; Georges Creek & Cumberland; Georgia Pacific; Houston & Texas Central; Kentucky Central; Kansas City, Ft. Scott & Gulf; Louisville & Nashville; Lehigh Valley; New York Central & Hudson River; New York & New England; New York, Philadelphia & Norfolk; Nashville, Chattanooga & St. Louis; New Orleans, Ft. Jackson & Grand Island; Northern Pacific; Ohio & Mississippi; Old Colony; Oregon Railway & Navigation Co.; Pennsylvania Railroad; Pennsylvania Lines West of Pittsburgh; Providence & Worcester; Philadelphia & Reading; Raleigh & Gaston; Richmond & Danville; Richmond, Fredericksburg & Potomac; South Carolina; South Florida; Savannah; Florida & Western; Wilmington & Weldon; Wilmington, Columbia & Augusta.

French Railroad Notes.

Writing from Paris, a correspondent of an Austrian technical journal contributes some notes on French railroads. According to his observations the double-head type of rail seems destined to abandonment in the near future, having been superseded by the Vignol pattern on nearly all the more prominent French roads, the Southern Railroad and the Paris Orleans road being notable exceptions. The double-head rail is, on these, still regarded with favor and retained in use. The increase in the weight of the rails used is worthy of note, those on the Western, the Northern, and the Paris Lyons and Mediterranean roads averaging 88½, 89 and 94½ lbs. per yard. Besides increase of weight there has been an increase in the length of the rails. A movement in the direction of rails longer than eight metres (26¼ ft.) was commenced in France more than 10 years ago. In 1879 the Southern road as well as the Orleans road used 36-ft. rails on some sections. At present the indications are that the normal length of the rail of the future will be 12 metres, or about 39½ ft. The advantages of the longer rails are found in the economy in track fixtures, fish-plates for example, greater track stability and smoother running. The handling of the rails, of course, becomes more difficult with increase in length, but this would scarcely seem to have much weight in the face of the benefits afforded.

In the matter of ties it is found that the ordinary wooden cross ties is in general use, the demand in part being met up to within a few years ago by shipments from Austro-Hungary. Thus, in 1885, the six largest French railroads

imported 900,000 ties, while 3,250,000 were obtained from native sources of supply. The dependence upon the foreign supply is gradually growing less, owing to the increasing home facilities, and the comparatively long life of the ties due to preservative treatment. Besides this the use of metal cross ties is growing steadily. The first noteworthy trials with these were instituted on the French government railroads, on which the designs of Paulet, Post, Boyenwal & Ponsard, Cantero and Severac were successively tested. The metal ties now in use on the Eastern and the Western roads deserve brief mention. On the former what is known as the Guillaume tie is used, in which an effort has been made to approximate closely to the wooden cross tie, especially in the matter of securing a flat, lower surface. The cross section of the tie is an inverted channel, and the ends are slightly turned down. The rail rests on wooden blocks placed in the hollow part of the tie, and is properly secured against tipping and lateral displacement. Each tie weighs about 143 lbs., the 39-foot rails weighing about 89 lbs. per yard. The requirements specified for tie on the Western road were that it should offer great resistance to lateral thrust and admit of proper fastening of the rails in chairs. An inverted trough-shaped tie was adopted. Holes are bored through the vertical sides of the ties and the chairs are cast on, the holes filling with metal, and thus helping to properly secure the chairs. The tie alone weighs 132 lbs.; with the cast-iron chairs the weight amounts to 242 lbs. In view of the good results secured with this tie on an experimental section, it is to be extensively introduced.

In the matter of fastening devices for the rails, steel is generally used. Chairs are employed to a considerable extent, being secured to the ties by means of screw bolts. These latter are also gradually displacing spikes where the rails are secured directly to the ties. In place of wooden wedges to secure the rails in the chairs, a bent steel strip is gaining favor, holding the rails through spring action. Angle plates are used at the rail joints in nearly all cases, the plain fish-plates being, however, retained on the government roads.

The arrangements adopted to prevent creeping of the rails vary according to the type of rail. In the case of double headers, one of the fish-plates, on either side of the rails, is so placed as to be braced against a rail chair. With flange rails, the horizontal leg of one of the angle plates is generally fastened to the cross tie by means of screw bolts.

On the Northern Railroad, where an 86½-lb. rail is used, the angle plates measure 26 in., and are secured by 1-in. bolts. The screw bolts are galvanized. A layer of tarred felt is placed between the rail flange and tie to prevent entrance of sand and moisture. The writer gives comparative tables showing the increase in weight of superstructure which is gradually being effected.

The United States Cruiser "Baltimore."

The official report of the speed and power trial of this steamer has been presented to the Navy Department, and changes somewhat the estimated figures (see *Railroad Gazette*, Sept. 20, 1889). A careful computation of the indicator diagrams shows that the indicated horse-power, instead of being in excess of the required 9,000, was only 8,977.88, or 23.12 below the requirements. It is believed that more power could be developed by using the auxiliary boilers, and the Secretary of the Navy has informed the contractors that he will either accept the vessel or allow another trial at their expense, as they may desire. Some particulars determined by the indicator diagrams are appended:

Average revolutions, 117.9 per minute; average boiler pressure, 122.2 lbs. per sq. in. above the atmosphere; average speed, 19.575 knots per hour.

Indicated Pressures, Pounds per Square Inch.

	Starboard engine			Port engine		
	H. P.	I. P.	L. P.	H. P.	I. P.	L. P.
Average.....	45.86	18.25	8.61	44.73	18.12	8.78
Averaging 1st hour.....	4,600			4,548.19		
" 2d hour.....	4,194.02			4,131.87		
" 3d hour.....	4,408.46			4,477.07		
" 4th hour.....	4,308.61			4,308.71		
At end of trial.....	3,831.14			3,718.32		
Average.....	4,391.44			4,347.17		
General average, including auxiliary engines.....	8,977.88					

Heating Cars in Massachusetts.

The Legislature of 1888 passed a law authorizing railroads to use such car heaters as should meet with the approval of the Railroad Commissioners, but with the provision that no common stove should in any case be permitted. The Commissioners approved of some forms of heaters, but notified the several railroads that this approval did not extend beyond Oct. 1, 1889; and intimated that the board might then approve only of a system of heating by steam from the locomotive. Since this announcement was made, the railroads running out of Boston have taken measures to meet the anticipated decision. The progress made in this direction by the several railroads is given below:

The Boston & Albany heats by steam all cars over which it has full control—that is, all local trains and trains to Albany. Some cars which are also run on connecting roads are not heated by steam, as these connecting roads have not had their locomotives and cars fitted for steam. Although the New York state laws require that all trains run in that state shall be heated by steam, the New York, New Haven & Hartford Railroad has failed to comply with the law. In consequence the Boston & Albany Railroad is unable to heat cars by steam on its New York trains, with one exception, and therefore, uses the Baker or Johnson heaters. There is one exception, the four o'clock express from Boston and the corresponding train from New York are both heated by steam. The cars run to connect with trains on the New York & New England are not heated by steam, as the couplers of the two roads are unlike, and so no connection between cars can be made.

The Old Colony Railroad intends to have all trains on its Providence Division heated by steam this winter. On the Central Division the company intends to make as rapid progress as possible in the work of establishing the new system. On the long routes—the boat trains and the trains to Newport—steam heating will be used this winter, and this system will be extended as rapidly as practicable.

The trains on the Western Division of the Boston & Maine will be heated this winter by steam from the locomotives. The trains on the other divisions will have the heaters used in other years. General Manager Furber is not yet convinced of the advantages of steam heating, but he is going to give it a fair trial this winter. He thinks, however, that steam heating will be more expensive than the old methods.

The New York & New England has equipped all the cars to be used this winter with steam-heating apparatus. Some cars owned by the company have not been thus fitted, as they are used only in summer for excursions and special occasions, but all trains run in cold weather will be heated by steam from the locomotive. The Baker heaters are kept in the cars, however, and can be used in cases of emergency, or for heating cars before the locomotive is attached.

All trains on the Fitchburg will be heated by steam this winter. It was necessary to have the through trains fitted with pipes; but in addition to this, all cars for the local trains will also be heated by the new method.

THE SCRAP HEAP.

Notes.

The Cleveland Car Service Association will go into operation Nov. 13, and the organizations at Buffalo and St. Louis are about completed.

When the boilers of the steamer *Corona* exploded, destroying forty lives, nothing was saved except the certificate of the United States boiler inspector, to the effect that the boilers were all right.—*Milwaukee Sentinel*.

The special train for the "All-America Congress," which was to run solid for 5,406 miles, met with a shade of grief almost at the start, a change of engines having been made necessary at Baltimore by the heating of a crank-pin.

The Michigan Central has lately discontinued the use of electric lighting by storage batteries, which system has been on trial under two passenger cars for some time, and is to light some cars with the Frost dry carburettor system.

The clerks employed by the Michigan Central and the Grand Trunk who work in Detroit but reside in Windsor, Ont., have, in consequence of the contract labor law, been notified by their employers that they must reside in Detroit or give up their situations.

The last lawsuit growing out of the Bussey Bridge (Forest Hills) disaster on the Boston & Providence, in March, 1887, has just been settled. A suit against the Central Vermont for damages incurred in the White River disaster, February, 1887, is now on trial in Massachusetts.

Railroads in Greece.

The construction of 445 miles of new railroad has been projected in Greece. Altogether there are now in operation only 371 miles of road, while the lines for which concessions have already been made and which are being laid down embrace about 207 miles.

The father of Twombly, the drunken engineer who caused the fatal collision near Chicago the other day, has been arrested on a warrant issued by the coroner. In his capacity as master mechanic, the elder Twombly is charged with having re-employed his son a number of times after the latter's discharge for drunkenness. A prima-facie case was thus made against him for discipline by the company, but now it seems that a far more serious charge may be sustained—that of contributing to the criminal recklessness which caused the accident.—*New York Tribune*.

Car Lighting in South America.

It is reported that the recent explosion of an oil lamp in a car of the Buenos Ayres Rosario Railroad, in the Argentine Republic, and the consequent destruction of the car by fire, has led to a government regulation that henceforth electric lighting should be adopted for railroad train service.

A Railroad to the Pyramids.

According to foreign advices it is intended to connect Cairo and the pyramids of Gizeh by means of a steam tramway, a concession for which has recently been granted by the Khedive of Egypt. Work is to be commenced during the coming winter.

Sutlej Suspension Bridge.

The suspension bridge lately finished over the Sutlej, near Bilaspore, by the Punjab engineers, is, according to *Indian Engineering*, in danger of being washed away, masonry, chains and all. The executive engineer who had charge of the bridge has, it is said, decided on the immediate dismantling of the whole of last season's work, and to spend the coming cold season in rebuilding it on a more permanent footing.

The Congo Railroad.

According to Brussels advices the cost of building the Congo railroad has been placed at \$5,000,000, and the working cost at \$240,000. The larger portion of the former sum is said to have been subscribed for by German capitalists. The work will be carried out by the Compagnie du Congo pour le Commerce et l'Industrie, which was formed in Brussels in 1887, and which obtained the concession to operate the line for a term of 99 years.

Railroads in the Colleges.

We have had occasion from time to time to mention special instructions given in the various colleges of the country in railroad matters. From the catalogue of Trinity College, North Carolina, it appears that a special course of lectures to the junior class will be delivered on railroads, embracing their history, the principles of management, social, political and economic consequences of the development of railroad transportation in the United States, efforts at government regulation, State ownership in European countries, etc.

Canadian Railroads.

During the last session of the Dominion Parliament, the sum of \$5,219,000 was voted toward the construction, maintenance and repairs of the several Canadian railroads owned and operated by the Dominion government. The several items in detail were as follows: Intercolonial, for the construction of an iron bridge at the foundry crossing, Truro, N. S., \$5,000; to provide a Y at Truro Station, \$7,500; extension along city front St. John, N. B., \$17,000; increased accommodation at St. John, \$25,000; Dartmouth branch, \$4,000; Indian town branch, \$4,500; rolling stock, \$17,000; increased accommodation at Halifax, \$150,000; increased accommodation at Moncton, \$67,500; repairs and working expenses, chargeable to revenue, \$3,200,000; Cape Breton railway construction, \$700,000; bridge over "The Narrows," \$400,000; Oxford & New Glasgow Railway, construction, \$300,000. Under the head of repairs and working expenses, the Eastern Extension receives \$90,000, Prince Edward Island \$205,000, and the Windsor branch \$24,000.

Foreign Railroad Notes.

Guatemala has conceded to a French syndicate the right to construct a railroad from the capital of Guatemala to Port Barrios, on the Atlantic Ocean. The length of the line will be about 220 miles, and the government will grant a subsidy for the construction and a guarantee of the interest on the capital employed. The Guatemala Central, with which readers of the *Railroad Gazette* are somewhat familiar, extends from the capital to the Pacific Ocean.

The Congress of Uruguay has authorized the Executive Government to contract with Messrs. Castro, Petty & Co. to construct a railroad from the port of Colonia to the frontier of Brazil, passing through Trinidad, Durazno and Cerro Chato. This line will be styled the "Ferro-caril Interior del Uruguay," and will extend diagonally through the entire territory of the Republic. It will cross all the existing railroads.

The project for a South American railroad to connect Buenos Ayres and Valparaiso was first agitated more than twenty years ago, the distance to be covered amounting to about 870 miles. It is interesting to note that now the con-

struction of the last and most important section of the line has been commenced, the work being in the hands of the well-known London firm of J. E. & M. Clark & Co. On the Argentinian side work has begun in 1870, and 640 miles of road, having a gauge of 5 ft. 6 in., are already in operation. The lines are worked by the Buenos Ayres & Pacific and the Argentine Great Western railroad companies. On the Chilean side about 83 miles, having a gauge of 4 ft. 8½ in., were laid down by the government. The last and connecting section over the Andes Mountains, now under way, will have a gauge of 1 metre (3.28 ft.) About 25 miles of track have already been laid. On part of this section the Abtrack rail system will be used. The summit tunnel will be three miles long, and at an elevation of 10,450 ft. above the sea. The road is to be finally completed in 1892.

The Business Outlook.

A reporter of the Philadelphia *Ledger* recently made a tour among the manufacturers of that city. The Baldwin Locomotive Works told him that they expect to exceed the output of last year, which was 739 locomotives. Their orders from Cuba and South America continue as heavy as last year, while those in the United States are increasing. Twenty-three hundred hands are employed, which is as many as they ever employ. The Southwark Foundry & Machine Co. says that business is much better than last year, with a steady increase. It is expected that the present condition of business will last for some time. Extensive enlargements have been recently completed and others are in progress. About 500 men are employed. J. G. Brill & Co., builders of passenger and street railroad cars, report business better than it was last year, and that they have as much work on hand as they can do. South American orders show an increase over last year. The firm now employs 460 hands—all they have room for. Their new works now building near Gray's Ferry will probably have a capacity for double the number of hands now employed. A portion of the new works will be ready for occupation by Dec. 1. Morris, Tasker & Co., manufacturers of pipes, boiler tubes, steam fittings, etc., report business as fairly good—better than last year, with a hopeful outlook. There is nothing like a boom, nor any indication of one. The two establishments of the firm employ from 1,200 to 1,500 hands. The Allison Manufacturing Co., manufacturers of freight cars and lap-welded pipes, report orders as many and coming in as freely as last year, and with the prospect for future business good. Foreign orders for South America and the West Indies are about as last year.

Tennessee Railroad Valuation.

The total valuation of railroad property in Tennessee for 1889 amounts to \$39,287,300, there being 2,623 miles in the state, an average of \$14,978 per mile. During the past two years there has been an increase of 395 miles. The total valuation of railroad and telegraph property for 1889 amounts to \$39,543,935. The average value per mile in Tennessee exceeds that of any state south of it, and is considerably more than the average value in any of the Western states. The increased valuation this year over the last assessment is about \$7,000,000.

RAILROAD LAW—NOTES OF DECISIONS.

Powers, Liabilities and Regulation of Railroads.

In Ohio the claimant's agent at Cincinnati telegraphed to the freight agent of receivers of a railroad at Springfield, Ill.: "Am asked to name rate on coal for Gas Co., Cin., to Springfield, Ill. Can I make necessary rate, divided on agreed per cents, via Lafayette?" The receivers' agent answered: "You are at liberty to make necessary rate on coke to Springfield Gas Co., and pro-rate on agreed per cents, via Lafayette, Ind." The claimant's agent, on receipt of this, replied: "See my wire 29th regarding rate on coal for Gas Co., Springfield. Answer." This was responded to by a second telegram, saying: "You are at liberty to make necessary rate on coal for Springfield Gas Co., etc." The U. S. Circuit Court in Missouri holds that the receivers could not repudiate the transaction on the ground that permission was given to make a rate only on coke and not on coal.

In Iowa the articles of incorporation of a railroad stated that its objects are to construct, operate and maintain a railroad from Dubuque in a westerly and northwesterly direction, in Iowa, Minnesota and Dakota, to a junction with the Northern Pacific. As formed, its line, consisting of 50 miles in Iowa, and that of the purchasing company, extend from Dubuque to St. Paul, Minn. It was not shown that defendant's reaching Minnesota, Dakota and the Northern Pacific was made a condition of the aid, nor that the road may not yet be so constructed. The Supreme Court rules that there was no such departure from the original course as to forfeit a subscription voted to it by a township and a tax raised thereunder; and that the railroad having expended some money and time in the construction of the road on the faith of the tax, between the date of the election and the date of an act repealing the law under which it was voted, the tax is saved from the operation of the repealing act.

In Texas a town voted aid to a railroad but afterward refused to issue the bonds, and the company brought suit resulting in a compromise judgment, by which the company became entitled to the bonds, and they were accordingly issued. The Supreme Court rules that the validity of the donation cannot thereafter be questioned by a taxpayer.

Carriage of Goods and Injuries to Property.

In New York the Supreme Court rules that a provision in a contract of shipment that the carrier "shall not be liable in any case or under any circumstances for loss of market," does not exempt the carrier from liability where the loss of market is caused by its negligence; and that a provision that no claim for damages for which the carrier is accountable should be allowed, unless a written notice of the claim is given within 36 hours after delivery of the goods to the freight agent nearest the place of delivery, applies to shipments beyond the carrier's lines, as well as to shipments to points on its lines, there being no limitation to that effect.

In Indiana, it is held by the Supreme Court that a contract under which goods are delivered to a carrier for shipment, which does not provide that its stipulations shall inure to the benefit of any other carrier, nor designate any other carrier, does not inure to the benefit of an intermediate carrier.

In New York, it is held by the Supreme Court that where a railroad agreed to transport goods to a point beyond its own lines, a provision that the carrier should not be liable for delays occurring on the connecting lines did not exempt it from damages for such delays resulting from the negligence of such connecting lines.

The Supreme Court of Minnesota rules that in negotiations for a deed to a railroad of a right of way over plaintiff's land, representations by defendant's agent that it was the intention of defendant to build a culvert convenient for plaintiff's cattle, and to build the railroad on a certain line where the land was not valuable, and to build a depot convenient for plaintiff, may be made the basis of a charge of fraudulent representations.

In Iowa the Supreme Court holds that evidence that the fires broke out after defendant's engine passed, where it is

not shown that they could have happened in any other way, justifies the jury in finding that they were set by the engine. In such case, where defendant's witness testified that an engine in good repair could not throw fire from the track to the place where the fire caught, the jury are justified in finding the engine in bad repair.⁸

In the same state the Supreme Court rules that a railroad is liable for setting a fire on its right of way which destroyed certain stacks of hay of plaintiff, though he was guilty of contributory negligence in failing to protect them by plowing around them.⁹

In Iowa a deed of a right of way to a railroad company through an 80-acre tract covenanted that the water on the southeast side of the road should be made to run on the same side of the road, instead of through cattle-guards. The grantor afterward conveyed 135 acres of his farm to plaintiff, of which but 29 acres were a part of the 80-acre tract. The Supreme Court holds that for breach of the covenant a recovery should not be restricted to the damage to the 80-acre tract, nor than to anything less than the grantor's whole farm, of which the 80-acre tract was a part, and that plaintiff's right of recovery extended to the damage to his 135 acres.¹⁰

The Supreme Court of Minnesota rules that a person entitled to the exclusive right to possess and use land abutting on a navigable lake or river is also, though he does not own the fee, entitled to enjoy the riparian rights incident to the land. And so, where a railroad company procured, to be condemned for its use, land abutting on the bay of St. Louis, it acquired the riparian rights belonging to it, although the petition for condemnation made no express mention of such rights.¹¹

Injuries to Passengers, Employees and Strangers.

In New Jersey the Supreme Court rules that a railroad employing a servant to work at a terminal point, and contracting to transport him to and from work, cannot lawfully require him to vacate a seat which he is occupying in the car to which he has been duly assigned in order to make room for a passenger who has paid his fare.¹²

In Nevada, the plaintiff claimed to have been ruptured while a passenger, by a collision. The train on which he was riding, being seated in the rear car, was run into from behind by a train running at the rate of from one to three miles per hour. The pilot slid under the hind end of the rear car, raising it up about 8 or 10 in., and shoving the entire train about 20 ft. Plaintiff testified that his first sensation was a push in his back, and that he was then thrown on his stomach on the seat in front, and he sank down between the seats, becoming insensible; that when he came to be tried to get up, and found that he could not use his right arm; that with the assistance of some one unknown to him he got into another car; that he felt terrible pains in his groin, and that it was only by pressing the affected part that he obtained any relief; and that he kept his hand pressed against that part until he reached his destination. A passenger and several of the defendant's employees testified that the shock was not severe enough to disturb any one; that after the accident they made inquiries all through the train as to whether any one was hurt, but heard no complaints. The medical experts testified that rupture could have been produced by such an accident. Witnesses also testified to complaints by plaintiff after reaching his home, and visits to physicians. The Supreme Court holds that the finding that plaintiff had been hurt in the collision will not be disturbed.¹³

In Wyoming the plaintiff claimed that injuries received by him while assisting in lowering an engine in defendant's shops were occasioned by an order of the "gang boss." The jury found that the "gang boss" had immediate control of the work, but that he was under the general control of the master mechanic; that the latter was not in the shops at the time, but that the foreman, who superintended the work in the shops under the general directions of the master mechanic, was present. The Supreme Court decides that the defendant could not be held liable for the negligence of the "gang boss" as a vice-principal in exclusive control of a department.¹⁴

In Idaho the Supreme Court holds that the traveling auditor of a railroad, whose duties are to travel on the company's cars from station to station on its roads and audit accounts, is a servant of the company and assumes the ordinary risks incident to the employment.¹⁵

In Iowa the plaintiff, while working at the crank of a windlass on a ditching machine on a railroad, was injured by being struck by a handle of the windlass. The windlass was controlled by a brake in charge of a co-employee, and the injury was caused by his releasing the brake without warning plaintiff. It appeared that plaintiff would not have been injured had he been warned. The Supreme Court rules that the evidence supported a finding that the co-employee was negligent and that plaintiff used due care.¹⁶

In Missouri, a shipper of cattle, while on the train, discovered that his cattle had been left behind, but was told by the conductor that at a certain station they would meet a train on which he could return. At midnight the conductor said to him, "Here is your train," and "be quick and get off." The train which he was to board was about 10 ft. away, and moving, and, at the third step after alighting, he fell into an uncovered water-way between the tracks and received the injuries complained of. The train stopped at a switch instead of the station, at which he was told the stop would be made. The Supreme Court holds that the railroad is liable; that the proximate cause of the injury was the act of stopping near a dangerous place and directing the plaintiff to alight, knowing that it was not at the regular and presumably safe station where plaintiff expected to alight, without notifying him that it was a different or dangerous place and without affording any means to discover or avoid the peril, and that this was gross negligence.¹⁷

In Georgia an employee riding on a train to his work, and being carried past the place he was bound to, jumped off, the train running at the rate of 25 miles an hour, and was injured. He alleged that he was excited, not knowing how he would be able to get back to the place. The Supreme Court holds that the railroad is not liable.¹⁸

In Idaho a fireman was killed by his engine running into a drift of snow at a high rate of speed. The train on which deceased was usually employed was stopped, along with other trains, by reason of a severe wind and snow storm. A special train drawn by two engines, in the second of which deceased was placed, was sent forward to clear the track of snow and ice, and while so engaged the accident in which deceased was killed happened. Deceased knew of the dangerous condition of the track, but not that the place of the accident was specially dangerous. He also knew of the extraordinary character of the employment, but accepted it without protest or request for indemnity. The Supreme Court decides that the railroad is not liable.¹⁹

In Georgia the Supreme Court rules that where a watchman in a railroad yard uses a platform appropriated to the transfer of freights for the purpose of running along it at night in the dark, the company is not liable for injuries received thereby, it not appearing that the platform was intended by the company for such a purpose, or that he had any reason to think it was so intended.²⁰

In Kansas, a brakeman, while switching and coupling cars ahead of an ordinary freight engine, after making a coup-

ling, took a position on the platform to which the pilot of the engine was attached, immediately in front of the boiler head, and behind the pilot beam, and was injured through the negligence of the engineer in driving the cars with great speed against other loaded cars. A switch engine with foot-boards and hand-rails had never been used in the yard, and the evidence was conflicting as to whether the position was one of danger, and whether it was not the usual custom in all yards on the road to ride on the pilot. The Supreme Court rules that it was for the jury to say whether the brakeman voluntarily chose a dangerous position, a safer one having been provided by the company.²¹

In New York a railroad yard was $\frac{3}{4}$ mile long and $\frac{1}{4}$ mile wide, and the plaintiff was employed there as a car-coupler. He had been so employed for six months, when he was injured in the discharge of his duty by stepping into a gutter, which was near the track, and from 4 to 12 in. deep, which caused him to fall, throwing his leg on the track under a passing train. He had been employed as car-coupler in the same yard some years before, and had labored for defendant in other capacities more recently, but not so as to require his presence in that part of the yard very frequently. Ashes were sometimes thrown into the gutter and removed. Snow also fell there, and there was some snow and water there at the time of the accident, which occurred in the night, plaintiff having a lantern at the time. He occasionally passed by the gutter, and hence had opportunities of seeing it. Plaintiff testified that he did not know of the existence of the gutter. The Court of Appeals affirms a verdict against the railroad.²²

In a case in the Supreme Court of the United States, an action by a locomotive engineer against the company for personal injuries, defendant contended that plaintiff was guilty of contributory negligence, because he was running at a greater rate of speed than he had been instructed to run, and because defendant's rules limited the speed to a certain rate before crossing trestles, while the accident happened near a trestle, when plaintiff was exceeding that rate. Plaintiff's evidence showed that he had been over the road but once before, did not know that the trestle was near, and had never seen or read the train rules. Defendant's superintendent testified that he knew plaintiff had been over the road but once before, instructed him not to exceed a certain rate of speed, and that he did not know that plaintiff had ever seen or read defendant's rules. The Supreme Court rules that the question of contributory negligence should have been submitted to the jury, and it was error to direct a verdict for defendant.²³

In Pennsylvania a brakeman was riding with his foot in the stirrup on the side of a flat-car, as he had often done before, and as others were in the habit of doing, and, in passing a lumber pile, between which and the car there was abundant room for him to pass in safety, the car was suddenly derailed, crushing him against the lumber. The Supreme Court holds that the court properly refused to say, as a matter of law, that he was guilty of contributory negligence.²⁴

In Missouri there was no sign-board at the crossing, as required by statute, and the evidence conflicted as to whether the bell or whistle of the train that killed the decedent was sounded. Defendant's evidence showed that decedent was negligent, but other evidence showed that he had never been over the public road, was unacquainted with the crossing, and that the railroad could be seen from the public road only when a few feet from the track. The Supreme Court holds that the question of decedent's contributory negligence was properly submitted to the jury. But the case is reversed because the damages given were too great and because the Court rules that it is error to ask witnesses in such case to "state whether or not the crossing is dangerous for a stranger crossing there," as calling for an opinion.²⁵

In Iowa the following special interrogatories were submitted to the jury: "Did plaintiff know before the injury that his team, or either of them, was afraid of the cars or engine?" "As plaintiff approached the engine, was his team or either of the horses frightened at the engine?" "Was the action of the team or either of the horses, as plaintiff approached the engine with the intent to pass, such as warned him that it was dangerous to make the attempt?" The Supreme Court rules that failure to answer the questions was no ground for setting aside a verdict for plaintiff, as he was not obliged to prove any of the facts suggested.²⁶

- 1 Central Trust Co. v. W. St. L. & P. R. Co., 38 Fed. Rep., 56.
- 2 Cantillon v. D. & N. W. R. Co., 42 N. W. Rep., 613.
- 3 Maddrey v. Cox, 11 S. W. Rep., 541.
- 4 Jennings v. Grand Trunk R. Co., 5 N. Y. Supp., 142.
- 5 Adams Ex. Co. v. Harris, 21 N. E. Rep., 340.
- 6 Jennings v. Grand Trunk R. Co., 5 N. Y. Supp., 142.
- 7 Albert v. M. & P. R. Co., 42 N. W. Rep., 394.
- 8 Johnson v. C. & N. W., 42 N. W. Rep., 512.
- 9 West v. C. & N. W., 42 N. W. Rep., 512.
- 10 Peden v. C. R. L. & P., 42 N. W. Rep., 625.
- 11 Hamford v. St. P. & D., 42 N. W. Rep., 596.
- 12 N. Y. L. E. & W. R. Co. v. Burns, 17 Atl. Rep., 630.
- 13 Wedekind v. South Pac. R. Co., 21 Pac. Rep., 682.
- 14 McBride v. U. P. R. Co., 21 Pac. Rep., 657.
- 15 Murty v. U. P. R. Co., 21 Pac. Rep., 660.
- 16 Nelson v. C. M. & St. P. R. Co., 42 N. W. Rep., 335.
- 17 Griffith v. Mo. Pac. R. Co., 11 S. W. Rep., 539.
- 18 Janett v. A. & W. P. R. Co., 9 S. E. Rep., 681.
- 19 Drake v. U. P. R. Co., 21 Pac. Rep., 590.
- 20 Hamilton v. R. & D. R. Co., 9 S. E. Rep., 670.
- 21 Mo. Pac. R. Co. v. McCally, 21 Pac. Rep., 574.
- 22 Harr v. N. Y. & H. R. R. Co., 21 N. E. Rep., 425.
- 23 Dunlap v. Northeastern R. Co., 9 Sup. Ct. Rep., 617.
- 24 Penn. R. Co. v. Zink, 17 Atl. Rep., 614.
- 25 King v. Mo. Pac. R. Co., 11 S. W. Rep., 563.
- 26 Andrews v. Mason City R. Co., 42 N. W. Rep., 513.

General Railroad News.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

- Berkshire, quarterly, $1\frac{1}{2}$ per cent., payable Oct. 1.
- Boston & Providence, quarterly, $2\frac{1}{2}$ per cent., payable Oct. 1.
- Central of New Jersey, quarterly, $1\frac{1}{2}$ per cent., payable Nov. 1.
- Cincinnati, Hamilton & Dayton, quarterly, 1 per cent. on the preferred stock, payable Oct. 1.
- East Tennessee, Virginia & Georgia, 5 per cent. on the first preferred stock, payable Nov. 15.
- European & North American, $2\frac{1}{2}$ per cent., payable Oct. 15.
- Freehold & Jamesburg Agricultural, 3 per cent., payable Oct. 21.
- Georgia Railroad & Banking Co., quarterly, $2\frac{1}{2}$ per cent., payable Oct. 15.
- Long Island, quarterly, 1 per cent., payable Nov. 1.
- New London Northern, quarterly, $1\frac{1}{2}$ per cent., payable Oct. 20.
- New York & New England, $3\frac{1}{2}$ per cent. on the preferred stock, payable Oct. 19.
- Pittsburgh, Wheeling & Kentucky, 3 per cent., payable Oct. 1.

St. Louis & San Francisco, quarterly, 1 per cent. on the preferred stock, payable Oct. 15.

St. Paul, Minneapolis & Manitoba, quarterly, $1\frac{1}{2}$ per cent., payable Nov. 1.

Sioux City & Pacific, $3\frac{1}{2}$ per cent. on the preferred stock, payable Oct. 1.

Vermont & Massachusetts, 3 per cent., payable Oct. 8.

Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Cleveland, Cincinnati, Chicago & St. Louis, annual, Cincinnati, Oct. 30.

Evansville & Terre Haute, annual, Evansville, Ind., Oct. 21.

Great Northwest Central, special, Ottawa, Oct. 21, to consider a proposed issue of bonds.

Lake Erie Essex & Detroit River, special, Windsor, Ont., Oct. 29, to consider a proposed mortgage.

Knoxville Belt, special meeting at Knoxville, Tenn., Nov. 2, for the purpose of acting upon a proposed mortgage.

New York, Lake Erie & Western, annual, 21 Cortlandt street, New York City, Nov. 26.

Northern Pacific, annual meeting of stockholders and special meeting of the preferred stockholders, Oct. 17. Transfer-books close Sept. 16, and remain closed until Oct. 18.

Ontario, Carbondale & Scranton, special meeting, New York City, Nov. 4.

Oregon & Transcontinental Co., special meeting, Portland, Or., Nov. 5, to take action on the question, which has already been submitted to the directors, whether the capital of the company shall be reduced or the company shall be liquidated and go out of existence.

Railroad and Technical Conventions.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The International Brotherhood of Locomotive Engineers will hold its twenty-sixth annual convention at Denver, Colo., Oct. 16.

The National Association of Railway Station Agents will hold its annual convention at Kansas City, Mo., Oct. 23.

The New England Railroad Club meets at its rooms in the United States Hotel, Beach street, Boston, on the second Wednesday of each month, except June, July and August.

The Western Railway Club holds regular meetings on the third Tuesday in each month, except June, July and August, at its rooms in the Phenix Building, Jackson street, Chicago, at 2 p. m.

The New York Railroad Club meets at its rooms, 113 Liberty street, New York City, at 7:30 p. m., on the third Thursday in each month.

The Central Railway Club meets at the Tift House, Buffalo, the fourth Wednesday of January, March, May, August and October.

The American Society of Civil Engineers holds its regular meeting on the first and third Wednesday in each month at the House of the Society, 127 East Twenty-third street, New York.

The Boston Society of Civil Engineers holds its regular meetings at Boston, at 7:30 p. m., on the third Wednesday in each month.

The Western Society of Engineers holds its regular meetings at its hall, No. 67 Washington street, Chicago, at 7:30 p. m., on the first Tuesday in each month.

The Engineers' Club of St. Louis holds regular meetings in St. Louis on the first and third Wednesday in each month.

The Engineers' Club of Philadelphia holds regular meetings at the house of the Club, 1,122 Gerard street, Philadelphia.

The Engineers' Society of Western Pennsylvania holds regular meetings on the third Tuesday in each month, at 7:30 p. m., at its rooms in the Penn Building, Pittsburgh, Pa.

The Engineers' Club of Cincinnati holds its regular meetings at the Club rooms, No. 24 West Fourth street, Cincinnati, at 8 p. m., on the fourth Thursday of each month.

The Engineers' Club of Kansas City meets at Kansas City, Mo., on the first Monday in each month.

The Civil Engineers' Society of St. Paul meets at St. Paul, Minn., on the first Monday in each month.

The Montana Society of Civil Engineers meets at Helena, Mont., at 7:30 p. m., on the third Saturday in each month.

The Civil Engineers' Club of Kansas holds regular meetings on the first Wednesday in each month at Wichita, Kan.

Western Railway Club.

A regular meeting will be held Tuesday, Oct. 15; subjects of discussion, "Compound Locomotives," to be opened by D. L. Barnes, of the Railroad Gazette; "Best Metal for Brake Shoes," to be opened by W. D. Sargent, of the Congdon Brake Shoe Co.

The Engineers' Club.

Last Saturday evening the first of a series of informal dinners was held at the house of the club, No. 10 West Twenty-ninth street. About 30 were present, and the event was a decided success. It is proposed to hold these dinners on the first and third Saturday evening of each month for the next six months. It is the intention to have them entirely informal, and it is expected that many will go to them directly from their offices. For that reason the hour has been made early, namely, 6:30 p. m. The plan is to have a table d'hôte dinner at a very moderate price, and in order to insure a sufficient number so that the price may be moderate, members of the club have been asked to subscribe to the series. Enough subscriptions have been secured to guarantee the success of the scheme. Those who do not subscribe can be sure of finding a seat by notifying the steward a day in advance. At present it is not proposed to have any formal or set discussions at these dinners, but to have a chairman, who will probably direct the talk somewhat according to the circumstances of the time. It is expected that each member will bring a guest if he chooses.

The club is in a prosperous state and apparently sure to be a success. The membership now is about 440. The club house is quite convenient and complete, including parlors, library and reading room, billiard room, and all of the usual conveniences of a club, and the second and third floors are given up to sleeping rooms, which are available for any member upon notifying the steward.

The American Institute of Mining Engineers at Ottawa.

Considerable disappointment was expressed at the small attendance at the fifty-fifth annual meeting of the American Institute of Mining Engineers, which opened at Ottawa on Tuesday, Oct. 1. When the meeting was first talked of being held there, it was announced that at least 250 members of the Institute would attend, which number, however, was reduced to 35, of whom only 30 were Americans, when heads were counted.

Tuesday evening, Oct. 1, the inaugural meeting was held in the Railway Committee Room of Parliament. At eight o'clock Sheriff Sweetland, as chairman of the Citizen's Reception Committee, took the chair, on his right being seated Sir John Macdonald and the Hon. Mr. Ross, representing the Quebec government, and on his left Mr. Thomas Egles-

ton, Vice-President of the Institute. Short speeches were made by Sir John and Mr. Ross, to which Mr. Egleson replied, concluding the first day's programme.

Wednesday morning the visitors were shown the sights of the city, visiting such places of interest as the extensive lumber mills of the Chaudière, the Parliament Buildings and government farm.

At four o'clock in the afternoon Prof. Egleson took the chair, when actual work opened. Dr. Ellis, of the Geological Survey of the Dominion, read a paper on "The Mining Industries of Eastern Quebec." The principal of these industries he pointed out are copper, asbestos, roofing and other slates, gold and silver, chromic iron, antimony and nickel. The copper mining was confined to two locations, the output of each being from 30,000 to 40,000 tons per annum. The asbestos industry he thought would speedily become the leading mining industry of the Province of Quebec.

The next paper was on "Natural Gas Exploration in Ontario," and was read by Mr. Chas. A. Ashburner, of Pittsburgh, Pa. He went into the history of explorations for natural gas in the St. Lawrence valley, between Montreal and Quebec, which had demonstrated the fact that natural gas could not be got in sufficient flow to make it of commercial value.

He ventured the opinion that natural gas would not be found in New York, the Ontario Peninsula, or the valley of the St. Lawrence in sufficient volume to pay for laying the pipes for any greater distance than ten miles, if so far; but that gas in small quantities might be found, which could be utilized near to the well for domestic or manufacturing purposes, he would not dispute. Considerable discussion followed on Mr. Ashburner's paper. Dr. Raymond, Secretary of the Institute, agreeing with the consensus of opinion that oil and gas come from animal remains. Mr. Ashburner quoted several authorities who expressed the opinion that as far as fluids had been made in California, oil and gas originated there from vegetable remains, while Eastern oils found their origin in animal fat. In the evening the local committee gave the visitors a reception at the Russell House, which concluded Wednesday's programme.

Thursday afternoon work was resumed by Doctor Bell, of the Dominion Geological Survey, who, in the absence of Mr. Gilpin, of Nova Scotia, read a paper on "The Geographical Relations of the Principal Nova Scotia Minerals." The paper went on to state that the principal gold fields of the province are situated along the Atlantic coast, while in Cape Breton iron ore is frequently met with yielding from 20 to 40 per cent. At Margaretsville copper had been found, while near Pictou it had been discovered to yield 40 per cent. The paper dwelt at some length on the coal fields of the Province and upon the gypsum deposits, which yielded the most prominent mineral to be found in Nova Scotia. Mr. Ashburner related that some years ago, at the instance of several Pennsylvania iron men, he had visited Nova Scotia, and he had reported what he found, but the United States men did not invest. He believed, however, that iron ore would eventually be shipped from Nova Scotia to the Eastern states. E. J. Ingalls, of Ottawa, read some notes on the silver mines of Port Arthur. Silver had been discovered as early as 1846, on Silver Islet, Thunder Bay, and in 1866 some work was done and then abandoned. A great deal of the country around Port Arthur was still unexplored, and he believed it was rich in silver ore, while many of the rocks in that locality carry iron. The present area, he stated, measures about 60 x 40 miles.

After Mr. Ingalls' paper had been disposed of, J. E. Hurdman, of Oldham, N. C. Scotia, contributed a paper on "Gold Mining in Nova Scotia," which tended to show the immensity of gold deposits in that province.

Dr. Peters, of Sudbury, contributed an interesting paper on the copper deposits of Sudbury. He dealt mainly with the process of extracting the ore from the rock. The different companies he showed were able to handle the ore at about 35 cents per ton.

Dr. Belle followed with a paper on "The Phosphate Deposits of Ottawa County."

At the conclusion of Dr. Bell's remarks the chairman announced that owing to the lateness of the hour the paper of Mr. Birkenbine, of Philadelphia, on "The Possibility of Iron Manufacture at Ottawa," would not be read, and declared the formal business of the session closed.

On Friday morning a start was made at 7:30 on a trip to the phosphate mines in the vicinity of Buckingham, Ottawa County. Friday evening a small party of the mining engineers left for the Sudbury Copper Mines, where they spent Saturday, leaving in the evening for Montreal, where they joined the rest of the party and proceeded to visit the mineral resources of the Eastern townships in the Province of Quebec before returning their respective homes.

American Institute of Electrical Engineers.

The thirty-eighth meeting of the Institute will be held on Tuesday, Oct. 15, at 8 o'clock p. m., in Dr. Doremus' Lecture Room, College of the City of New York, No. 17 Lexington avenue. A paper will be read by Mr. Thomas D. Lockwood, member, entitled: "Electrical Notes of a Transatlantic Trip." It will embrace some observations on telegraphy; description of the London operating room, the different instruments employed, the pneumatic tubes, and a brief discussion of governmentally owned telegraphs; electric lighting as carried on in England; the practice of telephony in Great Britain, certain peculiarities in apparatus and methods; also the use of electric motors. Some of the electrical features of the Paris Exposition will also be canvassed.

American Society of Civil Engineers.

A regular meeting of the Society was held Oct. 2, Vice-President Alphonse Fteley presiding. A paper on "Experiments Relating to Hydraulics of Fire Streams," was read by John H. Freeman, M. Am. Soc. C. E.

It was announced that the ballot on special committees on engineering subjects had been canvassed, and the appointment of the committees proposed at the annual convention at Sea Bright, N. J., was authorized.

The resolutions, giving the scope of these committees, were published in full in the *Railroad Gazette*, Oct. 13.

The following candidates were declared elected:

Members.—William Augustine Aiken, General Manager Mr. Vernon Bridge Company, Mt. Vernon, Ohio; Ward Baldwin, Principal Assistant Engineer Cincinnati, New Orleans & Texas Pacific, Cincinnati, Ohio; Sumner Homer Bodfish, Engineer U. S. Geological Survey, Washington, D. C.; Bernard Richardson Green, Superintendent and Engineer in local charge of the building for the Library of Congress, Washington, D. C.; Elias Bradford Noyes, Assistant Engineer in charge Champlain Canal Improvement, Fort Edward, N. Y.; Charles Olmstead Parker, Engineer Central Railroad & Banking Company of Georgia, Macon, Ga.; John Curtis Patterson, Assistant Chief Engineer Poughkeepsie Bridge and connections, Poughkeepsie, N. Y.; Olaf Ridley Phil, Assistant Engineer at Cascade Locks, Or.; Anderson Harvey Tyson, Reading, Pa.; Alva Morgan Van Aken, Denver, Col.

Juniors.—Friedrich Rosenberg, Supervisor New York Division Pennsylvania R. R. Jersey City, N. J.; William White Seitzinger, Assist. Engineer with Brown, Howard & Co., Tarrytown, N. Y.

PERSONAL.

—Mr. E. E. Jenks, Master Mechanic of the Ohio River road, has resigned.

—Mr. F. Young, Master Mechanic of the Terre Haute & Peoria, has resigned, and has been succeeded by W. G. Van Buskirk.

—Mr. C. A. McMaster, formerly Chief Train Dispatcher of the Denver & Rio Grande at Pueblo, has been appointed Division Superintendent of the Northern Pacific at Helena.

—Mr. W. E. Seabrook, Assistant Treasurer of the Georgia Pacific Division of the Richmond & Danville, having resigned, he has been succeeded by Mr. James E. Starke, who also continues Assistant Auditor of the Division.

—Mr. John Rinard, for many years Superintendent of the converting department of the Elgar Thomson Steel Works, has resigned, and will be succeeded by Mr. Harry Benn, who has been connected with this department for the last three years.

—Mr. A. H. O'Brien, who has been Assistant to the General Manager of the Philadelphia & Reading for some time, has resigned that position, and will hereafter have charge of Real Estate, Insurance Fund and Relief Association of the road.

—Mr. Robert Law, Superintendent of the Montana Union, having resigned, William H. Baldwin, recently General Manager of the Leavenworth Division of the Union Pacific, has been appointed to supersede him, with the title of General Manager.

—Mr. William P. Palmer having resigned the office of Secretary of Carnegie, Phipps & Co., Limited, of Pittsburgh, to accept the position of General Sales Agent, Mr. Otis H. Childs, formerly Secretary of the Apollo Iron & Steel Co., of Pittsburgh, has been appointed to succeed Mr. Palmer.

—Capt. George Skinner, Superintendent of the Chattanooga, Rome & Columbus, died in Rome, Ga., Oct. 1, of paralysis of the brain, aged 60 years. He was formerly Superintendent of the Louisville Short Line, Scioto Valley and Canada Southern, and also held other responsible positions in railroad service. Capt. Skinner's funeral will take place at Auburn, N. Y., where his family reside.

—The control of the Ohio, Indiana & Western having passed into the hands of the Cleveland, Cincinnati, Chicago & St. Louis road, Charles E. Henderson has resigned his position of General Manager, and has been succeeded by J. A. Barnard, who is at present Purchasing Agent of the Ohio & Mississippi. Mr. Henderson continues as General Manager of the Ohio Southern. He was appointed General Manager of the Indiana, Bloomington & Western in October, 1881, and in July, 1886, he became Receiver. On its reorganization as the Ohio, Indiana & Western he was again appointed General Manager.

ELECTIONS AND APPOINTMENTS.

Delaware River & Lancaster.—The officers of this company are: Robert Crane, President; George Crane, Treasurer; Isaac W. Guldin, Secretary; E. D. North, General Solicitor; and H. R. M. Whitman, Engineer. The general office is at No. 112 South Fourth street, Philadelphia.

Duluth & Southwestern.—M. J. Jacke, J. A. McLeod, E. H. Smith and William Ames, all of Minneapolis, and A. A. Mead, of St. Paul, are the incorporators of this Minnesota company.

Georgia Midland & Gulf.—The annual meeting was held in Columbus, Ga., Oct. 2, and the old board of directors was re-elected, also the following officers: J. E. Grannis, of New York, President; John F. Flournoy, of Columbus, Vice-President; T. C. S. Howard, of Columbus, Secretary and Treasurer, and G. Gunby Jordan, of Columbus, General Manager.

Georgetown, Silver Creek & Chicago Lakes.—This company has been chartered in Colorado by C. R. Fish, C. W. Pallard, William Spinnall, George W. Hall, Henry Seifried, A. B. Forbes and John Fellius, all of Clear Creek County.

Hodenville & Elizabethtown.—With one exception the old Board of Directors was re-elected at the recent annual meeting. The directors are: Thomas H. Hays, Mr. Krebs, J. L. Frazier, Gen. John Echols, and T. W. Bullitt. Jacob Hubbard was re-elected President.

Kansas City, Chattanooga & Fort Royal.—The stockholders of the company recently elected the following directors: J. F. Shipp, T. M. McConnell, D. J. O'Connell, W. C. Smith, John A. Moore, W. J. Willingham, C. E. Jones, J. C. Wells, S. A. Bright.

Lackawanna & Montrose.—The directors of this company are: W. D. Lusk, Montrose, Pa., President; W. J. Mulford, H. L. Beach, W. H. Jessup, W. W. Williams, H. P. Read, W. G. Farke, J. Griffiths, R. M. Bostwick, E. P. Pope, J. R. Cooley, T. J. Davies, and Daniel Sayre, all of Montrose.

Lake Erie & Western.—At the adjourned annual meeting of the company, held at Bloomington, Ill., to elect three directors to serve three years each, President Calvin S. Brice and George F. Stone were re-elected. There is still one vacancy, which will probably be filled at the next meeting of the board of directors.

Lake Shore & Michigan Southern.—T. W. Niles, Superintendent of the Grand Rapids Branch, has been appointed Assistant Superintendent of the Franklin Division, and R. C. Harris, Chief Train Dispatcher of the Franklin Division, has been promoted to the place vacated by Mr. Niles, with office in Kalamazoo, Mich.

Minneapolis & St. Louis.—The stockholders of the road held their annual meeting in Minneapolis, Oct. 1. The directors elected were as follows: W. H. Truesdale, Joseph Gaskell, vice C. F. Hatch, deceased; L. C. Mitchell, to succeed A. Kimball, and W. D. Hale, vice Thos. Withrow, resigned. The old officers were elected: W. H. Truesdale, President; J. F. Springer, Vice-President; Joseph Gaskell, Secretary and Treasurer.

Montana Union.—William H. Baldwin has been appointed General Manager, with headquarters at Butte City, to succeed Robert Law, Superintendent, resigned.

Northern Pacific.—C. A. McMaster has been appointed Division Superintendent on the road, with headquarters at Helena, Mont. S. G. Ramsey has been appointed Acting Superintendent of the Idaho Division, with headquarters at Sprague, Wash., to succeed J. M. Scott, resigned.

Ohio, Indiana & Western.—J. A. Barnard has been appointed General Manager of this road to succeed Charles Henderson, resigned. Oscar G. Murray has been appointed General Traffic Manager. These changes are a result of the acquirement of control by the Cleveland, Cincinnati, Chicago & St. Louis.

Philadelphia & Reading.—The office of Assistant to the General Manager having been discontinued, A. H. O'Brien, in addition to such other duties as may from time to time be assigned to him by the Vice President and General Manager, to whom he will report, will have direct supervision of all matters pertaining to real estate, rights of way, the insurance fund and the relief association.

Point Defiance.—Incorporated in Washington by Isaac W. Anderson, Thomas B. Wallace, Allen C. Mason, Stewart Rice and Hugh C. Wallace, all of Tacoma, Wash.

Richmond & Danville.—James E. Starke has been appointed Assistant Treasurer of the Georgia Pacific Division, in place of W. E. Seabrook, resigned, and will also remain Assistant Auditor of the Georgia Pacific Division, Richmond & Danville. His duties will embrace disbursements and accounts pertaining to new construction, and such duties as may be assigned to him by the Fourth Vice-President. His office will be at Birmingham, Ala.

Rio Grande Junction.—The officers and directors of this line now are: D. H. Moffatt, President; S. T. Smith, Vice-President; E. R. Murphy, Secretary; J. W. Gillyly, Treasurer, and these, with W. S. Cheesman and A. S. Hughes, form the board of directors for the first year.

Seaboard & Roanoke.—The annual meeting of the stockholders of the road was held in Norfolk, Va., last week. The old officers of the company were re-elected, and the following were elected directors: L. McLane, R. C. Hoffman, Enoch Pratt, Monroe Robinson, Jr., B. B. Jordan and R. S. Tucker.

St. Clair Tunnel Co.—The following directors were elected at the annual meeting of the stockholders, held at Detroit recently: H. A. Vidal and Chas. Mackenzie, of Sarnia; Joseph Hickson and L. J. Sargeant, of Montreal; E. W. Meddaugh and W. J. Spicer, of Detroit. Joseph Hickson was elected President; L. J. Sargeant, Vice-President; and Robert Wright, Secretary and Treasurer.

St. Louis, Arkansas & Texas.—Notice has been given of the establishment by this company of a Freight Claim Department for the investigation and adjustment of all claims for overcharges and loss and damage to freight. The department has been placed under the supervision and control of the Accounting Department, S. C. Johnson, Auditor. George C. Arnold has been appointed Freight Claim Agent in charge of Freight Claim Department, with headquarters at St. Louis, Mo.

Terre Haute & Peoria.—W. G. Van Buskirk has been appointed Master Mechanic, with office in Paris, Ill., to succeed F. Young, resigned.

Texas Trunk.—J. J. Kertin has been appointed Superintendent for the Receiver, with headquarters at Dallas, Tex.

OLD AND NEW ROADS.

Alabama Midland.—The entire line of this road is now graded from Bainbridge, Ga., through Ozark and Troy, to Ada, on the Northwest Florida, with the exception of a few miles at Troy. The line has been in operation between Bainbridge and Ozark for some time, and the track is now laid to near Troy. It is expected to have trains running into Montgomery by Dec. 1.

The survey of the Montgomery, Tuscaloosa & Memphis, the extension of this road from Montgomery to Tuscaloosa, has now been completed to within 20 miles of Tuscaloosa. A plan is said to be under consideration for continuing this line from Tuscaloosa on to a connection south of Jasper with the Birmingham, Sheffield & Tennessee River road, and then running over that line to Sheffield, and building from there to Milan, Tenn., connecting with the Illinois Central, which would give a new route from the Mississippi Valley to the Atlantic Coast, the Alabama Midland being operated in harmony with the "Plant system."

Albany & Astoria.—The preliminary survey of this road from Albany to Tillamook, Oregon, has been completed. The distance is 90 miles. The elevation at the summit of the divide between Yamhill and Tillamook is 770 ft. The route surveyed goes through territory likely to afford considerable traffic, and the surveys have hastened back to Albany to complete some locating surveys before the wet season sets in.

American Midland.—The latest report concerning this road, which is now being operated from Findlay to Ottumwa, O., 23 miles, is that it has been purchased by several persons interested in the Pittsburgh & Western, who propose to complete it east to Akron, to connect with the Pittsburgh & Western, and also complete it to Fort Wayne, Ind., to which point it is nearly graded.

Atchison, Topeka & Santa Fe.—No plan of reorganization has yet been given out, but it is understood that one has been agreed upon by the directors, which provides for a refunding of the present bonded indebtedness in a four per cent. general mortgage bond of about \$160,000,000, with \$80,000,000 in income bonds as a bonus for reduced interest. In this way the fixed charges would not be above \$8,000,000, against \$11,000,000 at present. No security is to be assessed, and in 60 days or so the plan is not generally accepted, the creditors can seek their rights under the law. The total bonded debt is now \$135,000,000. The general four per cent. mortgage will probably be drawn for somewhat less than \$160,000,000, with the right to increase for new mileage at a fixed rate per mile.

Atlantic & Danville.—This road was opened last week from Clarksville to Milton, Va. Engineers are still surveying in Brunswick and Mecklenburg counties in Virginia, and it is stated that the line will be completed to Danville early in December.

Beaubarnois Junction Branch.—This company has given notice that it will make application to the next Quebec legislature for articles of incorporation with power to construct a road from a point on the Beaubarnois Junction road to a point at or near Blisson, Que., on the St. Lawrence River.

Blue Mountain Mineral.—It is stated that the financial arrangements have been completed for building this road in North Alabama, and that work will commence at Anniston very soon. J. A. Gabury is President, and Mr. Martin, of Jacksonville, Ala., is also interested.

Bowling Green & Northern.—The right of way has now been secured for this road from Bowling Green to Grayson Springs Station, Ky., 40 miles, and it is expected that grading will commence in a short time. The contract for grading and tracklaying is not yet signed, but it doubtless will be in a few days.

Brockville, Westport & Saint Ste. Marie.—The final survey is now being made for the extension of this road from Westport, Ont., to Sharbot Lake, a distance of 18 miles. As soon as this survey is completed the contract for grading will be let.

Burlington & Missouri River.—The region that is about to be opened by the Burlington & Missouri River, in Wyoming, promises to be one of the richest sections in the United States for coal and oil. Less than two years ago coal prospectors investigated the resources of northwestern Wyoming. The result convinced them that the supply of coal was almost unlimited. The mines at Newcastle are owned by Kilpatrick Brothers, the contractors on the Alliance extension. The terminus of the road in Wyoming will be about eight miles from Newcastle at a point named Cambria. Already 200 cars of coal are waiting at Newcastle to be shipped as soon as the track reaches there. By Nov. 15 the company expects to begin hauling out the coal. Calculations have been made of the probable amount of coal in the mines around Newcastle, and they indicate that the enormous amount of 1,000,000,000 tons of coal are hidden away in the earth within an area of fifteen miles square. The veins now being worked by Kilpatrick Brothers are eight feet in thickness. The formation of the country in which the mines are located is very peculiar. There are several deep cañons in the mine region about 1,000 ft. apart. In depth they average about 200 ft. Shafts have been sunk in the sides of the cañons. Kilpatrick Brothers at this time have already opened four shafts 8 ft. high by 12 ft. wide. The track runs along the cañons, and trestle work will be built over it so that the coal can be carried from the mines and trapped directly into the cars. About 25 houses have been built at the town of Newcastle, and Kilpatrick Brothers will put in water-works costing \$20,000. The road is straining every nerve to open the coal and oil regions. The track from Grand Island northwest is laid with heavy rails. —*Nebraska State Journal.*

Canadian Pacific.—The contractors for the Souris Branch report grading completed beyond Melgund, 39 miles south of Brandon, Man. Men and teams are receiving \$3 per day; teamsters, \$30 per month and board; graders, \$1.75 per day; board, \$4 per week. The gross earnings of this system for August, 1889, were \$1,421,755, the working expenses were \$759,371, and the net profits were \$662,384, an increase over the same month last year of \$243,056. For the eight months, Jan. 1 to Aug. 31, 1889, the gross earnings were \$9,166,778, the working expenses were \$5,922,923, and the net earnings were \$3,243,854, an increase over the same period last year of \$1,309,628.

Chicago & Northwestern.—It is expected to have the cut-off from Evanston to Montrose, Ill., seven miles, completed by Nov. 20. The line is built to shorten the route for freight traffic from Milwaukee to points south and east of Chicago, and when completed will save 16 miles of the present route between Evanston and Montrose, 23 miles.

Chicago, Burlington & Quincy.—The gross earnings of the road for August were \$2,580,806, an increase over the same month last year of \$307,103; the expenses were \$1,441,735, a decrease of \$150,078, and net earnings were \$1,139,070, an increase of \$457,180.

Chicago, Greenfield & Northern.—This company has been incorporated in Ohio to build a line from Rushville to Noblesville, Ind., with a branch to Anderson, passing through the Indiana natural-gas field. The capital stock is \$1,000,000.

Chicago, Santa Fe & California.—The suit of Williams, McRitchie, Nicol & Williams, contractors, against the company for work performed in the construction of the railroad bed, asking a judgment of \$188,000, was completed in the Circuit Court at Macon, Mo., last week, after a trial of nine days. The railroad claimed there was only due the contractors \$30,800. Under the contract between the contractors and the company, the measurements and findings of the railroad's engineers were declared to be binding and final, but the plaintiffs claimed them to be fraudulent. The court held the parties to the contract, and instructed the jury to return a verdict only allowing the plaintiffs what the railroad's engineer's calculations and measurements gave them. The work in dispute was 40 miles, from a point three miles west of Grand River, in Carroll County, through Chariton, Linn and Macon counties, Mo.

Cincinnati, Alabama & Atlantic.—Clinton and Wayne Counties, Ky., last week Saturday voted \$135,000 to the road, which is to be built from Somerset, Ky., to Huntsville, Ala.

Colorado Short Line.—This company has filed articles of incorporation in Colorado, with a capital stock of \$30,000,000, the incorporators being largely interested in the Denver & Rio Grande, in whose interest the new line is to be built. The charter is very general, and allows the company to build roads in Western Colorado, Southern Utah and Northern Nevada. From Nevada the road is to branch, one portion going through Southern California and the other toward San Francisco.

Cumberland Valley.—The extension from Martinsburg, W. Va., southerly to Winchester, Va., 22 miles, was formally opened last week by running an excursion train over the line, followed by a parade of various bodies through Winchester.

Delaware River & Lancaster.—About 200 men are at work on this road, which is being built from Phoenixville, Pa., along French Creek to the Falls of French Creek. Several routes have been surveyed for further extensions from these points, but the company has not yet decided which to adopt. There are three iron bridges, two being 100 ft. long and one 80 ft. long. The contractors on the first section of 12 miles are: Knauer & Harrison, St. Peters, Pa.; W. H. Davis, Pughtown, Pa., and Angelo Palladina, Kimberton, Pa.

Duluth & Southwestern.—This company has filed articles of incorporation in Minnesota, with a capital stock placed at \$60,000, to build a railroad from Duluth in a southwesterly direction to Cheyenne, Wyo. Ter.

East Tennessee, Virginia & Georgia.—At a meeting of the directors, Oct. 8, a five per cent. dividend on the first preferred stock was declared. On the reorganization of this company in 1885, it was provided that the first preferred stock (\$11,000,000) should be entitled to a non-cumulative dividend of not more than five per cent. per annum and have the right for five years to elect the majority of the directors unless before that time it should have received five per cent. dividends for two years. The dividend now declared being the second, the franchise is now restored to the other classes of the stock, the second preferred and the common.

Fairhaven & Southern.—Tracklaying on this line is going on at the rate of a mile a day. In three or four days track will be laid to Samish Lake, Wash.

Fort Worth & Rio Grande.—Trains will be running into Stephenville, Tex., this week, and in a few weeks to Dublin, Tex. The grading between Stephenville and Dublin is making rapid progress, and much of it is now finished. Two of the largest bridges on this section are also nearly completed.

Georgetown, Silver Creek & Chicago Lakes.—This company has been incorporated in Colorado with a

capital stock of \$100,000 to build a road from Georgetown to the Chicago Lakes. The route is as follows: From Georgetown along the base of Saxon and Columbian Mountains to Silver Creek, thence around and over Columbian mountain to Cascade Creek, along Griffith Mountain and Chicago Creek to Chicago Lakes.

Grand Occidental.—It is reported that the Canadian Pacific has taken over the construction and running of this line from St. Jerome to Lake Nominigua, P. Que., and that the work will now be pushed through by the contractor, H. J. Beemer, as rapidly as possible.

Great Falls & Canada.—This company has been incorporated in Montana to build a road from Great Falls to the Canadian line, whence the same parties will build to the coal mines at Ilthridge, Canada. The principal incorporator is Donald Grant, of Winnipeg. The capital stock is \$2,500,000.

Green Pond, Walterboro & Branchville.—This road, owned by Colleton County, S. C., has been sold to the Charleston & Savannah, with which it connects at Green Pond. It extends from Green Pond to Walterboro, 12 miles, and the Charleston & Savannah pays \$45,000 for the road and rolling stock, etc., and assumes the payment of the first mortgage bonds, \$15,000, payable in 1903, with seven per cent. interest.

Hereford.—The government commissioner appointed to investigate the claims of the employees of this road has reported on 600 cases, recommending the government to retain \$38,000 out of the subsidies granted to the road for the purpose of paying the men their wages. The total claims are \$70,000.

Hutchinson & Southwestern.—Under this name articles of consolidation between the McPherson, Texas & Gulf, to extend southwest from McPherson, Kan., and the Hutchinson, Oklahoma & Gulf, to extend south from Hutchinson to the Indian Territory, have been filed in Kansas. The line is at present constructed only from Hutchinson to Kingman, but the extension to Oklahoma is to be prosecuted at once. The capital of the new company is \$750,000.

Indianapolis, Decatur & Springfield.—The bondholders of the road met in New York last week and ratified the report of their committee. A plan of reorganization was adopted providing for the foreclosure of the mortgage, and bonds will be deposited with the Central Trust Co. to be used for that purpose.

Iowa Central.—A branch is being constructed from a point on the main line, two miles north of Oscaloosa, Ia., to the mines of the Excelsior Coal Co., 3½ miles distant. The track will be laid by Nov. 15. C. C. Gilman, of Marshalltown, Ia., has the contract for grading, bridging and tracklaying.

Kansas City & Southern.—Judge Brewer, of the United States Circuit Court, at Kansas City, Mo., has handed down a decision to-day in the case of B. Schlessinger et al. against the Kansas City & Southern Railway, in which he affirms that the debts of the Southern Railway Construction Co. cannot be collected from the railroad. The road-bed over which the present line is operated was begun in 1876 by the Kansas City, Memphis & Mobile, which went into bankruptcy. The construction company undertook to complete the line, and ordered from the plaintiff 5,000 tons of steel rails, valued at \$50,000. The rails were never delivered, but suit was brought to recover damages, and the court allowed damages to the amount of \$35,901. In the meantime the road and its appurtenances had been sold in 1880 to the present holders for the sum of \$250,000. Judge Brewer, after reviewing the case fully, decides that the sale was made in good faith and with no effort to avoid liabilities, and that the Kansas City & Southern is in no way responsible for the debts of its predecessor.

Lackawanna & Montrose.—This company has been incorporated in Pennsylvania to build a road ten miles long from Montrose to Montrose Depot, on the Delaware, Lackawanna & Western. The capital stock is \$50,000. W. D. Lusk is President.

Lackawanna & Southwestern.—Articles of merger and consolidation of the Lackawanna & Southwestern and of the Rochester, Hornellsville & Lackawanna companies have been filed at Albany, N. Y. The new company thus formed is incorporated with a capital of \$280,000.

Lehigh Valley.—The contract between the city of Newark, N. J., and the East Jersey Water Co., a corporation organized by the Lehigh Valley Railroad, for a new water supply for Newark, has been completed. It amounts to nearly \$6,000,000. The East Jersey Water Co. has sold 3,000 shares of stock, and has \$3,000,000 deposited in bank. Work on the new water supply will be begun at once, and will be finished in three years. The pipes will be laid in the bed of the Morris Canal, and the water brought from reservoirs to be constructed in the Passaic River watershed, about 40 miles from Newark. The city has the option of paying either in cash or bonds at 4 per cent., and the work is to be accepted upon approval by the city's engineers. The full supply guaranteed is 50,000,000 gallons daily.

Louisiana, Arkansas & Missouri.—About 200 men and 50 teams are working on this road between Brinkley, Ark., and Alexandria, La. This section of the road is being built by the Fruin Bambrick Construction Co., of St. Louis, Mo. W. C. Agnew, of Youngstown, O., is Chief Engineer.

Louisiana, North & South.—It is expected to begin tracklaying on the extension from Gibland to Sparta, La., this month. The extension is 16 miles long, and will be opened for traffic Dec. 1. Holstin & Walker are the contractors.

Louisville, Cincinnati & Dayton.—This company, as already noted, has been voted a tax of two per cent. (\$60,000) in Madison Township, Ind., to aid in the construction of the road from Aurora to Madison, Ind., and then to Jeffersonville, on the north side of the Ohio River. The right of way has now been secured between Madison and Jeffersonville, and it is stated that ground will soon be broken at Madison. Col. J. C. Fawcett, of Louisville, is the President.

Louisville, Hardinsburg & Western.—The bridge over Sinking Creek has been completed, and it is now expected that trains will be running between Clarksport and Hardinsburg, Ky., by Oct. 20. Work is now in progress on a short tunnel, but this will soon be completed.

Lynchburg & Durham.—The company has a regular train now running from Lynchburg, Va., to Brookneal, and is fast pushing the grading to Durham, N. C. The grading is nearly finished to South Boston, in Halifax County, Va., some 25 miles, and the company expects to begin running trains by Nov. 1. The bridge over Staunton River is complete, and track is laid south of the bridge some nine miles. The work is progressing rapidly in North Carolina, from Durham northward. Carrington & Kelly, of Lynchburg, have the most of the work, grading, bridges and culverts, etc., on the whole line, except 10 miles near Durham, which has been let to Codwise & Allen. The road will be 115 miles long.

Marquette Iron Range Construction Co.—A company of this name has filed a charter in Illinois to build a railroad from Ishpeming, Mich., to Lake Superior, at or near Marquette. The capital stock is \$1,000,000. Frank Butterworth, H. V. Harris and E. D. Comings are among the incorporators.

Maravatio & Iguala.—This narrow gauge line of 31 miles is being built from the main line of the Mexican National to Iguala by the Trojes Mining Company, of England. The contractor is D. Shaw, who has the line all graded and has begun tracklaying and bridge work. The line will be completed in two months.

Michigan Central.—The company is putting 80-lb. steel rails on its main line between Chicago and Detroit. About 100 miles of single track have already been equipped, and it is proposed to double-track a very considerable portion of the road. The preliminary work is now under way between Grass Lake and Dexter, and the last link between Dexter and Ypsilanti will be completed before the end of the year. All the grades on the loop line between Jackson and Niles will be reduced, so as not to exceed 20 ft. to the mile. The new track is to be laid with the company's Standard rail and 44-in. angle bar.

Mississippi River & Bonne Terre.—This line, which is being built by the St. Joe Lead Co., has been opened for traffic from Bonne Terre, Mo., to Crystal City. But five miles remain to be built to complete the line to Illinois Station on the St. Louis, Iron Mountain & Southern, about 30 miles northeast of Bonne Terre.

Missouri Pacific.—On the branch of the St. Louis, Iron Mountain & Southern, through the Indian Territory, from Coffeyville, Kan., to Wagoner, 82 miles, grading and tracklaying have been completed with the exception of 17 miles. When opened, this new line will shorten the route from Little Rock to Kansas points nearly 200 miles.

New York Central & Hudson River.—The following table shows the earnings and expenses of the road for the quarter and the year ending Sept. 30.

Quarter ending Sept. 30.	1889.	1888.	Inc. or Dec.
Gross earnings.....	\$9,703,000	\$9,190,062	I. \$512,938
Oper. expen.....	6,650,000	6,548,439	I. 101,562
Net earnings.....	\$3,053,000	\$2,641,623	I. \$411,377
Fixed charges.....	1,964,000	1,966,884	D. 2,883
Balance.....	\$1,089,000	\$674,739	I. \$414,260
Dividend.....	894,283	894,283	I. 434
Surplus.....	\$194,717	\$80,456	I. \$114,261
Year to Sept. 30.	1889-9.	1888-8.	Inc. or Dec.
Gross earnings.....	\$35,651,000	\$36,132,920	D. \$478,920
Oper. expen.....	23,967,000	24,626,338	D. 639,338
Net earn.....	\$11,684,000	\$11,506,582	I. \$177,418
Fixed charges.....	7,854,000	7,831,463	I. 22,537
Balance.....	\$3,830,000	\$3,675,118	I. \$154,882
Dividends.....	3,577,132	3,577,132	I.
Surplus.....	\$252,868	\$97,986	I. \$154,882

New York, Lake Erie & Western.—The following report shows the earnings for August and the 11 months of the fiscal year:

August:	1889.	1888.	Increase.
Earnings.....	\$2,778,708	\$2,440,706	\$337,992
Expenses.....	1,694,623	1,540,960	153,663
Balance.....	\$1,084,084	\$899,805	\$184,278
Due leased lines.....	248,860	218,754	30,106
Net.....	\$835,224	\$681,051	\$154,173
Eleven months to Oct. 1:	1889-9.	1888-8.	Decrease.
Earnings.....	\$24,478,146	\$24,839,190	\$361,043
Expenses.....	15,882,557	16,142,133	259,576
Balance.....	\$8,595,589	\$8,697,066	\$101,476
Due leased lines.....	2,175,572	2,183,829	8,257
Net.....	\$6,420,017	\$6,513,236	\$93,219

Northwestern Railway Company of Canada.—It is now understood that the St. Paul, Minneapolis & Manitoba road is endeavoring to secure the franchise of the company. Mr. Brinckenhoff, of St. Paul, has recently been in Ottawa taking the necessary preliminary steps to secure a transfer of the charter. At its last session the Canadian Parliament voted a land grant to this company of 10,000 acres per mile for the road from Calgary, Man., to a point on the Saskatchewan River, near Edmonton, a distance of 210 miles, and also 10,000 acres per mile for the road from Calgary southerly to Lethbridge, N. W. T., a distance of 120 miles, making the total land grant 3,310,000 acres.

Northern Pacific.—The earnings of the Northern Pacific for the month of September show an increase of \$377,647 over the same period last year. The September earnings, as compared with the same period last year, were as follows:

	1889.	1888.	Inc.
Freight.....	\$1,474,632	\$1,141,828	\$332,804
Passenger.....	543,192	469,122	73,769
Mail.....	37,000	35,000	2,000
Express.....	30,000	28,792	1,208
Miscellaneous.....	4,100	20,332	*16,232
Totals.....	\$2,088,924	\$1,711,275	\$377,649
Miles of road oper.....	3,507	3,393	114

*Decrease.

The Secretary of the Interior has rendered a decision in the case of J. Henry Allers, Peter Bengt, the St. Paul, Minneapolis & Manitoba Railroad, and the Northern Pacific road, the conflicting litigants for a small tract of land in the Fergus Falls (Minn.) land district. The land in controversy, it appears, is within the granted limits of the first-named road and within the indemnity limits of the Northern Pacific. At the date of the grant to the St. Paul road a pre-emption filing was of record and in force for the tract in question. Subsequently, on Dec. 19, 1871, the map of definite location of the St. Paul road was accepted by the Secretary of the Interior. The notice of indemnity withdrawal for the benefit of the Northern Pacific's line was received at the local office on Jan. 10, 1872, and on Dec. 29, 1883, it applied to select the land as indemnity for lands lost. About six months thereafter the St. Paul company applied for the same tract under its grant. About the middle of the following year Allers and Bengt each applied for the land in question under the Homestead Law, the original pre-emption filing having long since lapsed. The real question at issue is whether the Northern Pacific can select as indemnity lands lying within the granted limits of the other road which, at the date of the grant to the latter, were excepted from its grant by reason of the pre-emption filing then in force, but which subsequently reverted to the government because of the failure of the party making it to make good his claim, which failure

is equivalent to abandonment. The Secretary holds that neither the fact that the land in controversy is within the grant limits of the St. Paul road, nor the expired pre-emption filing, constitutes a bar to its selection as indemnity by the Northern Pacific.

Nova Scotia Central.—This road is now about completed. The track has been all laid, and ballasting and stations will be done by Nov. 1, and the company expects to open for business about Dec. 1. The main line is about 75 miles long, extending from the Windsor & Annapolis road at Middleton to Lunenburg, on the Atlantic Coast, passing through the ports of Bridgewater and Mahone. The construction was all done by the railroad company, and is thoroughly first-class. The bridges are steel and culverts solid masonry. The locomotives are from the Rogers Locomotive Works, at Paterson, N. J., and the passenger cars are from the Jackson & Sharp Co., of Wilmington, Del. Robert H. Fraser, of Bridgewater, N. J., is Superintendent.

Oregon Pacific.—Construction work on this line is being pushed as rapidly as possible toward the summit of the Cascade Mountains. The working force is being increased with a view to complete the line to Summit this season.

Oregon Railway & Navigation Co.—This company has laid track this year on extensions and branches which aggregate 86 miles. This track was laid on three different branches, as follows: The Pleasant Valley Branch of the Oregon Railway Extension Co. from Palouse River to Oakesdale, W. T., 37 miles. This completes this branch from Winona Junction to Saltese Junction, W. T. On the Mullan Branch of the Washington & Idaho Road from Tekoa to St. Joe, 23 miles have been laid, and on the Spokane Branch of the Washington & Idaho from Rockford to a point about one mile south of Spokane Falls, W. T., 26 miles have been laid. The Washington & Idaho has under construction at the present time the branch line from St. Joe to Mullan, Idaho, a distance of 64 miles. The track will probably be laid on this branch before the close of the year. Kilpatrick Bros. & Collins, of Beatrice, Neb., are the contractors who have done all the work above mentioned.

Pennsylvania.—This company is reported buying right of way for a proposed branch from Greensboro, Pa., up the Little Sewickley for a distance of ten miles, to reach a coke field and a productive mining district.

Pennsylvania, Poughkeepsie & Eastern.—The bridge over the Delaware River at Portland, Pa., has been completed, and trains will probably be running from Boston to Philadelphia via the Poughkeepsie Bridge early in November. The tracks of the New York, Lake Erie & Western will be used from Pin Island to Campbell Hall, N. Y., and those of the New York, Susquehanna & Western from Augusta to Swartwood, N. J., for the present.

Philadelphia & Reading.—The company has let a contract for double tracking the Williamsport Division from Shamokin to Sunbury, Pa., 18 miles, and also from Lewisburg to West Milton, 5 miles. A wooden bridge at Reynolds Station is to be replaced by an iron one. Iron bridges are also being built at Muncy, Milton and Sunbury, the last one being almost finished.

The following is the report of the August gross and net earnings of the company:

Month of August.	1889.	1888.	Inc. or dec.
Earnings.....	\$1,901,599	\$1,901,416	D. \$2,817
Expenses.....	899,954	890,894	I. 9,060
Net.....	\$1,001,645	\$1,043,522	D. \$41,877
Since Dec. 1.	1888-9.	1887-8.	Inc. or dec.
Net.....	\$5,565,013	\$6,202,186	D. \$637,173

Point Defiance.—Articles of incorporation have been filed in Washington. The capital stock is \$100,000, and the object is to build a road from Tacoma to Point Defiance.

Port Arthur, Duluth & Western.—Cormee & Co., contractors for this line from Port Arthur, Ont., to Duluth, have 15 miles completed and are pushing work forward with all possible speed.

Puget Sound & Grays Harbor.—This line has been completed to Elma, Wash., and passenger trains will be running there this month.

Qu'Appelle, Long Lake & Saskatchewan.—Nearly 100 miles of this road have been graded, and by Dec. 1 it will be completed to Saskatoon, to which point it is expected the line will be in operation before Christmas. Laborers are receiving \$1.50 per day and teams \$2. Four hundred teams and 1,200 men are now employed. The road will be 250 miles long, extending from Regina, on the Canadian Pacific, to Prince Albert. The grading is mostly prairie work. The maximum of grades is 65 ft. and of curves 5 deg. James Ross of Montreal is the principal contractor. H. S. Holt, Sherbrooke, P. Que., D. D. Mann, of Winnipeg, and William McKenzie have large contracts on the line. H. D. Lamsden is Chief Engineer.

Quebec & Lake St. John.—It is again announced that the extension of this line from Lorette, Que., to the north bank of the St. Charles River, opposite the Gas wharf, where the stream is to be bridged, will be undertaken shortly.

Sault Ste. Marie & Hudson Bay.—The projectors of this road will apply to the next Provincial Legislature of Ontario for a charter to build from Sault Ste. Marie to James Bay, at or near Moose Factory, in Ontario. The promoters of the scheme are William Bell, Joseph Cozens and John McKay. The projected road is about 370 miles long and traverses a valuable lumber and mineral district.

Sonora, Sinaloa & Chihuahua.—Large shipments of rails are now arriving at Deming, N. M., and Guaymas, Mexico, for this road. The Rosenfield Construction Co., of Denver, Col., has the contract for tracklaying from Deming to the Mexican line, and it has already shipped its construction outfit. A large portion of the grading on the Mexican end of the line has also been completed.

South Carolina.—The United States Circuit Court at Charleston, S. C., has appointed ex-Gov. D. H. Chamberlain temporary Receiver of the road, in the suit of F. W. Bound, a second mortgage bondholder. The road has been in default for over a year on all its mortgage debts, and the Receiver is appointed in order to apply the income of the road to the interest due on the mortgage debt. The appointment of a temporary Receiver is made at once in order to preserve the property of the company intact until an order can be made for a permanent Receiver, and the question of the jurisdiction of the state in the Federal courts can be determined.

South & North Alabama.—The suit of the City of Montgomery, Ala., against the Louisville & Nashville, involving about \$300,000 worth of South & North Alabama Railroad bonds, has been compromised and settled, the city receiving \$46,000 worth of bonds guaranteed by the Louisville & Nashville Co.

Spokane Falls & Northern.—This road is now completed, and in operation from Spokane Falls, Wash., north, a distance of 75 miles, to a point called Chewala,

within 13 miles of Colville. It is expected to complete this line through Colville 15 miles north to the Columbia River, by Oct. 15.

St. Louis, Alton & Terre Haute.—This line is now operated under a lease to the Indianapolis & St. Louis road between Terre Haute and St. Louis, 193 miles. The rental under the present arrangement is considered excessive by the lessor, and negotiations were recently begun for the absolute purchase of the line by the Cleveland, Cincinnati, Chicago & St. Louis, which, as the successor of the Cleveland, Columbus, Cincinnati & Indianapolis operates the Indianapolis & St. Louis. For some reason, however, the negotiations have been suddenly broken off, and it is believed that the company will take no further step at present for the purchase of the line.

St. Louis, Arkansas & Texas.—The answer of the company for the lines in Arkansas and Missouri to foreclosure proceedings has been filed in the General Court at St. Louis. It is asked that the company be permitted to pay the interest and take its property out of the hands of receivers. The road, it is alleged, is in a prosperous condition, that it is gaining in earnings each week, and there should be no foreclosure. Figures showing the earnings and operating expenses since the reconstruction and reorganization present only a slight deficit.

St. Joseph & Grand Island.—The Leavenworth, Topeka & Southwestern, extending from Leavenworth to Topeka, 56 miles, and the Kansas Central, 106 miles, heretofore operated separately as a division of the Union Pacific, has been consolidated with this company and jurisdiction of the officers of the St. Joseph & Grand Island has been extended over it.

St. Louis & Peoria.—The extension of the St. Louis & Chicago from Mount Olive to Alhambra, Ill., a distance of 14 miles, was opened for traffic Oct. 2. Trains will be run into St. Louis over the Illinois & St. Louis tracks. The company expects to transport about 800 tons of coal a day from the Mt. Olive coal mines.

Tombigbee.—The two companies of this name in Alabama have been consolidated, with a capital stock of \$100,000.

Texas Western.—All arrangements have been made to extend the road to a point 15 miles east of Sealy, Tex., its present terminus, where it will connect with the Taylor, Bastrop & Houston, or Missouri, Kansas & Texas road. The gauge is to be changed to standard, new bridges built and entirely new equipment purchased.

Union Pacific.—The Attorney-General of Nebraska has commenced proceedings in the State Supreme Court for the annulment of the charter of the Midvale extension of the Omaha & Republican Valley road, from Kearney to Calloway, Neb. The road was graded in 1886 and 1887 ready for tracklaying, but since then no work has been done. A local company was recently organized at Kearney to build over practically the same route.

Vincennes, Oakland City & Owensboro.—The contract for building this road between Vincennes, Ind., and Owensboro, Ky., 70 miles, has been let, but the company at present declines to give the name of the contractor. It is claimed that the grading will begin within 60 days, and work pushed from Vincennes to Oakland City and Boonville to Owensboro. Edward Watkins, of Vincennes, is President, and C. W. Bransford, of Owensboro, is Secretary.

Wabash.—The Federal Court at Council Bluffs, Ia., has refused an application to close the Clarinda branch of the Wabash because it didn't pay expenses, the judge holding that courts have no right to deprive people of transportation facilities on such a ground. The attorney of the United States Trust Co. had applied for an order to have the Clarinda branch from Roseberry, Mo., to Clarinda, Iowa, suspended as the receipts were not sufficient to pay expenses. The order was refused, the court declaring that railroads are governmental institutions, public conveyances and common carriers. The right to build a road through private property was granted on the representation that the road would furnish transportation for the public. By obtaining the right of way from the people, they were cut off from all similar means of transportation.

Western Union Telegraph.—The annual report presented at the annual meeting in New York, Oct. 9, for the year ending June 30, shows:

	1889.	1888.	1887.
Gross earnings.....	\$20,783,194	\$19,711,161	\$17,191,909
Operating expenses....	11,565,152	14,649,592	13,154,628
Net.....	\$6,218,041	\$5,070,571	\$4,037,281
Interest and sinking fund.....	835,655	530,258	533,065
Balance.....	\$5,382,386	\$4,540,313	\$3,504,216
Dividends.....	4,309,520	4,043,940	3,111,864
Surplus.....	\$1,072,866	\$2,496,364	\$2,692,352
Total surplus.....	8,611,401	7,496,548	7,002,185

The capital stock is \$86,199,853, the same as last year, of which \$26,050 is in the treasury. The bonded debt is \$12,056,012, against \$6,737,038 in 1888, the increase being due to the issue of \$5,361,000 five per cent. bonds for guaranteed securities. Cost per message was 22.4c., against 23.2c. in 1888, and average rate per message was 31.2c., the same as last year. The amount of money expended on the property uncanceled was \$10,209,585, against \$9,059,750 a year ago. The additions to the property this year were 7,379 miles of line, 31,449 miles of wire and 1,329 new offices. The company invested in new property in the year about \$1,200,000, or about \$100,000 more than the surplus for the year. In 10 years the company has increased its mileage 115 per cent., its wires 208 per cent., its offices 116 per cent., and messages sent 116 per cent.

West Virginia & Pennsylvania.—The engineers have completed the preliminary survey between Rowlesburg, W. Va., and Fairchance, Pa., connecting at the former point with the Baltimore & Ohio, and at the latter with the Pennsylvania. It is stated that contracts for grading will be let immediately. If built, the line will traverse rich coal and iron lands in West Virginia, and will be an important feeder of the Baltimore & Ohio. The chief office is at Kingwood, W. Va.

Wyoming, Salt Lake & Northern.—The survey from Evanston, Wyo., has been completed west to a connection with the line running east from Salt Lake City. The heaviest grade is near Evanston, where it is 82 ft. to the mile, the rate for the rest of the distance being 32. A tunnel 3,500 ft. long will be necessary to get through the mountains.

TRAFFIC.

Traffic Notes.

Chicago dispatches report considerable rate cutting by means of harvest excursion tickets, which are plenty in the Chicago scalpers' offices. Tickets are freely sold reading

from Indianapolis to Denver, the Chicago Denver portion being sold at a cut of \$4. The Kansas City rate is also cut to \$10. Some of the tickets are of the form of the harvest excursion ticket, but with the word "harvest" omitted.

It will be remembered that Chairman Walker recently rendered a decision in which he denied the petition of the Minneapolis & St. Louis for leave to reduce the grain rate between Zumbrota, Minn., and St. Louis to 17½ cents. Receiver Truesdale, of the Minneapolis & St. Louis, has now given notice that the rate will be reduced according to the rule, notwithstanding the adverse decision.

For the month of September the Buffalo Weighing and Inspection Bureau raised shippers' weights from 5,444,788 lbs to 5,896,345, about eight per cent. The amount added to way bills aggregated \$927, of which over one-third was from changes in classification.

Application has been made to the Attorney-General of Nebraska, asking him to begin proceedings in the Supreme Court to compel the several railroads in the state to adopt and put into force the schedule of coal rates recently made by the State Board of Transportation. This order reduces the rates materially, and, although promulgated some two months ago, has never been obeyed.

The American Mining & Smelting Co. and others have filed a complaint with the Inter-state Commerce Commission against the Denver & Rio Grande, alleging an unreasonable through rate on bullion shipped from Leadville, Col., to Missouri River points. They also charge that a much lower through rate is given by the railroad company from Salt Lake City to the Missouri River, whereby great prejudice is caused to shippers of bullion at Leadville. It will be remembered that this matter was recently the subject of a decision by the chairman of the Inter-state Commerce Railway Association.

The Western States Passenger Association has voted that on Nov. 1 the passenger rate from Chicago to Denver be raised from \$26 to \$30.65, the rate in force before the Alton lowered it on account of manipulations. The advance is subject, however, to all tickets capable of being manipulated being taken up before November.

The Chicago, Milwaukee & St. Paul has been indicted by the United States Grand Jury at St. Paul for violation of the Inter-state Commerce law, in charging higher rates from the East to the interior towns than to St. Paul and Minneapolis. The complaint is from Faribault, Minn.

A Chicago dispatch of Monday states that extensive rate manipulations have been going on in the Southwest for some time on various roads. A railroad officer is reported as saying:

"About a month ago it was charged that the Chicago, St. Paul & Kansas City was carrying larger quantities of grain from St. Joseph to Minneapolis and of cattle from St. Paul to Chicago than were reported. For September that road reported 637 cars of grain into Chicago, where it is positively known that between 2,000 and 3,000 cars were carried. The grain was delivered to the road at St. Joseph by the Kansas City, St. Joseph & Council Bluffs. One day a prominent shipper went into the office of the Kansas City, St. Joseph & Council Bluffs and presented orders for rebates on 1,100 cars of grain, the orders having been issued by the Chicago, St. Paul & Kansas City. The shipper, by his mistake, had exposed the whole thing. It was then discovered that the original report of the manipulated grain having gone to Duluth, via Minneapolis, was a mistake. The most of it had been originally billed to Duluth, but was rebilled at Oelwein to Chicago, the rate being thus cut from one to two and a half cents.

"For the last month the Chicago, St. Paul & Kansas City has had almost a monopoly of the Montana and Dakota cattle traffic from St. Paul to Chicago. An investigation disclosed the fact that the Chicago, St. Paul & Kansas City passes on account of 'stock' grown on almost every sage bush in the cattle country." It is said the officials claim the rate was a mistake made by a clerk.

The accusations against other roads are not given so much in detail but are equally positive.

East-Bound Shipments.

The shipments of east-bound freight from Chicago by all lines for the week ending Saturday, Oct. 5, amounted to 59,246 tons, against 58,912 tons during the preceding week, an increase of 334 tons, and against 59,105 tons during the corresponding week of 1888, an increase of 141 tons. The proportions carried by each road were:

	W'k to Oct. 5.		W'k to Sept. 28.	
	Tons.	P. c.	Tons.	P. c.
Michigan Central.....	5,433	9.2	5,109	8.7
Wabash.....	4,731	8.0	4,994	8.5
Lake Shore & Michigan South.....	10,500	17.7	11,134	18.8
Pitts., Ft. Wayne & Chicago.....	7,610	12.9	6,523	11.1
Chicago, St. Louis & Pitts.....	8,583	14.5	7,885	13.4
Baltimore & Ohio.....	3,495	5.9	3,644	6.2
Chicago & Grand Trunk.....	8,323	14.0	8,618	14.6
New York, Chic. & St. Louis.....	3,386	5.7	3,141	5.3
Chicago & Atlantic.....	7,155	12.1	7,864	13.4
Total.....	59,246	100.0	58,912	100.0

The three Vanderbilt lines together carried 32.6 per cent., while the two Pennsylvania lines carried 27.4 per cent.

Central Traffic Shipments.

The shipments of flour, grain and provisions from Chicago to the East by the lines in the Central Traffic Association, for the week ending Oct. 5, amounted to 24,336 tons against 23,129 tons during the preceding week, an increase of 1,207 tons, and against 31,331 tons during the corresponding week of 1888, a decrease of 6,995 tons. The details are as follows:

Roads.	Flour.	Grain.	Provisions.	Tons.	P. c.
C. & G. T.....	214	2,100	3,077	5,391	22.1
M. C.....	171	3,664	2,043	5,878	24.2
L. S. & M. S.....	347	2,232	1,358	3,937	16.2
P., Ft. W. & C.....	845	1,859	904	3,608	15.0
C., St. L. & P.....	82	971	295	1,368	5.6
B. & O.....	133	908	1,277	2,318	9.5
N. Y. C. & St. L.....	195	1,447	154	1,796	7.4
Total.....	1,997	13,181	9,158	24,336	100.0
Same week of 1888.....	2,820	22,573	5,968	31,331	
Decrease.....	823	9,392		6,995	
Increase.....			3,220		

The percentages during the corresponding week of 1888 were as follows: Chicago & Grand Trunk, 17.3; Michigan Central, 20.4; Lake Shore, 15.7; Fort Wayne, 19.4; C. St. L. & P., 8.8; Baltimore & Ohio, 16.6; N. Y. C. & St. L., 12.1.